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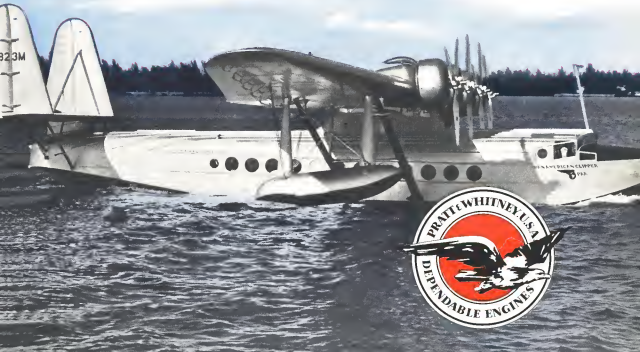
AVIATION

The Oldest American Aeronautical Magazine



This Issue

DESIGN AND PRODUCTION

Spinning problem attacked by new research instruments, page 15

Automatic mixture control becomes a reality, page 35

First specifications of the new Douglas Transport, DC 3 page 64

New engine has ingenious crankshaft vibration damper, page 36

Latest N.A.C.A. lateral control the slot lip aileron, pages 16, 18

Stainless steel in tension members page 30

Structural sketches of the Boeing 247-D page 20

TRANSPORT

What pilots think of cruising control, page 25

Solving the mixture control problem, page 35

Air mail can be sold to the public, page 29

Instrument and beam flying explained in practical language, page 11

The new McKellar Air Mail Bill, page 58.

ARMY AND NAVY

Naval air forces cooperate with fleet in Pacific maneuvers, page 60

England, France, Italy and other countries plan air force increases page 62

Border air base discussion brings Presidential censure, page 58

PILOTS AND FLYING SERVICES

Secrets of a successful airplane distributor, page 22.

How much time must students have before they are qualified for cross country flight? page 47

Specifications for the new Stinson Reliant page 42

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AVIATION

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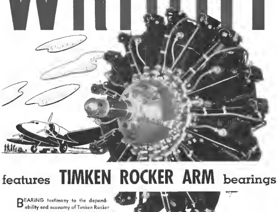

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Wright Cyclones also power high-speed transports on the following European airlines: Oesterreichische Luftverkehrs A.G. (Austria), L.A.P.E. (Spain), Avio Linee (Italy) and Deutsche Lufthansa (Germany).

Cyclone-powered Swissair Douglas Air[illegible]

[illegible] F-36 Transport

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WRIGHT

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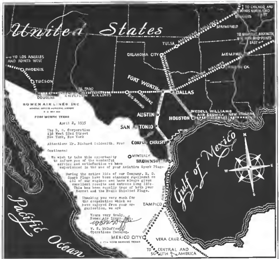

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Instrument and Radio Flying

Few men are as well qualified to speak on instrument flying as is the author of this article. Out of his long experience as a member of the Department of Commerce piloting staff engaged in blind landing research, as instructor in instrument flying for American Airlines, Mr. Cutrell outlines certain practices which he has found useful in instrument flight training and radio beam flying, and discusses some of the faults and difficulties which are commonly encountered.

By E. A. Cutrell

IF YOU are a pilot and wish to become competent in the type of flying required for S A T rating your entire training in instrument and radio navigation should be planned along lines that will best qualify you to meet all conditions with which you will be faced in getting through the three hundred and sixty-five different kinds of weather to be found the year around With all the facilities, aids and improvements developed since 1922 you must realize first that there are still very definite limitations as to the weather conditions that even the most qualified pilots can go through safely The two most important limiting factors at this time are "icing conditions" and visibility conditions at destination De-icing or ice-preventing auxiliaries are still in the development stages, and facilities to approach for landing safely under conditions of low ceiling and poor visibility must still be classed as experimental The technique obtained in your training is only the foundation on which you may build (by long practice) your knowledge and experience for safety in handling the problems of all-weather flying

When first taking the controls under a hood use the so called 1 2-3 system

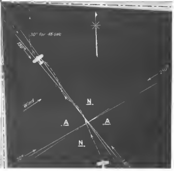


Fig 1 A typical radio range station chart showing the first method of approach by volume-of-signal orientation These courses 150 330 and 70 250 are satisfactory for giving a picture of the layout of the Chicago range. The actual true courses are 152 332 and 68 248

...trolling the airplane about its three axes by means of the turn, bank and rate of climb indicators. The 1-2-3 system as outlined in Stark's book on blind flying constitutes learning to control the airplane by correcting the three instruments *one at a time, in the order given* until it becomes natural or mechanical to coordinate them. For example, if the turn indicator hand is off center, correct it with the rudder until you get it centered regardless of the amount of pressure necessary on the pedal. With the turn indicator in the center, next fix your attention on the ball of the bank indicator and bring it to center with the ailerons, then move your attention to the climb indicator and bring the hand to zero with the elevators. Finally, go back to the turn indicator and repeat the process in rotation as before.

During this practice rely completely on the indications of the instruments and disregard your sense of balance or feeling as to the position of the airplane. At times you will suspect that you are leaning to one side or the other and may have some doubts about the correctness of the functioning of the instruments but remember that you have nothing else to go by and must accept their indications completely.

When it becomes easy to keep all the instruments centered try the same system for gentle turns. Instead of keeping the turn indicator in the center keep it off on the right side just the width of the hand. This time you will be making a gentle bank of about 15 deg. You may experience difficulty in keeping the turn indicator from increasing its off center position. If so use sufficient opposite pressure on the rudder pedal to return it to the desired position. Sometimes it will seem necessary to use an undue amount of rudder to gain this end. If at any time the airplane gets into a position that seems strange and you have trouble centering the instruments go back to the 1-2-3 system by first centering the turn hand with rudder, the ball with ailerons, then rate of climb with the elevators.

In a short time you will find that by the 1-2-3 system you have learned to coordinate your ailerons and rudder so that in centering the turn indicator and ball you are *at times* correcting the ball with the rudder and centering the turn with the ailerons. This is perfectly correct and natural and means that you have acquired a natural "feel" with the instruments and are able to co-ordinate your controls by watching them. If you find that you are not co-ordinating the bank and turn indications, practice correcting the ball with the rudder by bearing on the left rudder when the ball is off center to the left, the right rudder when the ball is off to the right, and at the same time hold the turn hand in the center with the ailerons. Bear in mind that it is *always* necessary to go back to the 1-2-3 system whenever the airplane gets in an abnormal or unknown attitude.

Fig. 2, left: The second volume-of-signal method of approach showing flight paths for the three different sets of conditions outlined in the text

Flying blind by compass

The next step is to learn to fly a compass course. Glance at your compass two or three times and determine the approximate reading. Turn either to an east or west heading by moving the turn indicator either to the left or right just the width of the hand. The compass will oscillate so that when attempting to keep it on an east or west heading it will be necessary to take the mean of the oscillations as the reading. Practice until you are able to follow a comparatively straight course.

Next from either an east or west heading place the turn indicator hand one width from the center position and hold for one minute. Then return to center position and check your compass heading to determine whether or not the turn hand was off center too much or too little to complete a 180 deg. turn in one minute. Continue making these turns until you are able to determine the proper position for the turn hand both to the right and left side to complete 180 deg. turns in one minute within a limit of 15 deg. error.

The next step is to practice flying at various engine speeds to obtain different air speeds in level flight or glides of different rates of descent and in climbs. In each of these conditions learn to adjust the stabilizer and throttle so that it will become just as natural to change them while flying by instruments as at any other time.

Practice making steep banks of 45 deg. and recovering to normal flight position. Practice recovering from spirals, tailspins and unusual maneuvers to feel confident that the airplane can easily be righted from any unknown attitude.

Except when intentionally climbing or losing altitude, make all your practice flights at some constant altitude and try to maintain it within plus or minus 100 ft. This practice will develop a habit of using the altimeter mechanically as one of the flight instruments instead of using it merely as a check on your height above the earth. This will become very important when flying near the ground or for making landing approaches.

Familiarity with radio

Before attempting to fly the radio range beams thoroughly memorize and fix definitely in mind the "N" and "A" quadrants of the radio range station in the vicinity of which you are flying. Learn the magnetic beam courses of this range station within the nearest five degrees indicated by graduation marks

Right: A typical set of flight control instruments as installed in the Vultee Transport

Fig. 3, below: Method of establishing gyro compass course from radio range beam showing how to make final corrections during the last 2 or 3 miles of the approach

on the dial of the compass or directional gyro. The quadrants and courses, particularly the courses of the beam on which an approach to the airport is made, should be so thoroughly memorized that the complete layout of the range station can be instantly visualized without reference to a chart (Fig. 1). Next learn the schedules on which regular weather broadcasts are made so that your radio problems can be worked between broadcast periods.

When flying a beam the volume of the received signals should be maintained constant by use of the volume control. It should become a habit when following a beam to keep the volume adjusted to the proper tone at all times. By the proper tone is meant a moderate normal signal intensity for your ears. In case your volume control skips from a loud to low tone so that close adjustment is difficult, advantage can be taken of the tuning dial to reduce the tone to any extent when necessary although the volume control method is preferable.

The principal reasons for maintaining a normal volume are: (a) by becoming accustomed to one volume of signal you are able to estimate by the rate of increase the approximate distance from the range station; (b) you are more able to tell by the strength of the "N" and "A" identification signals in relation to your approximate distance from the station, about how far you are from the on-course of the beam; (c) you train your ears to detect more accurately the cone of silence and the following build-up of signal; (d) you can more readily prove that you have crossed the station by the subsequent fading signal; (e) you can distinguish more easily the increase, fade or twilight zone in working an orientation problem.

Orientation—volume method

One of the most difficult radio problems has been orientation from an unknown position in the vicinity of a radio range station. In invoking the volume-of-signal method of orientation the only beam course or flight courses necessary to remember are the *inbound* and *outbound* courses of the leg which you expect to follow into the radio range station to make an approach down to the airport. This will be referred to as the approach beam. The general layout of the beams, however, and their rela-

tion to the vicinity of the airport should be thoroughly memorized A few simple instructions for practicing orientation by the volume-of signal method follow If your position in relation to the radio range station is unknown, turn to the *outbound* gyro or compass course of the approach beam Turn the volume control down slightly less than the proper tone for your ears Be careful not to adjust the volume again until you are certain that the signal is increasing or fading Also avoid touching the ear phones or electrical switches for that might vary the intensity of signal Continue flying the straight course until the volume of signal becomes quite noticeably lower You are then assured that the radio range station is behind you, and by either the "N" or "A" signal you know in which direction to turn to pick up the approach beam If the signal increases, your course can be continued until you have passed beyond the range station sufficiently far to know that you are in either the "N" or "A" quadrant that bounds the approach beam Then you turn in the direction as indicated by the signal, until arriving at the twilight zone when you will assume the inbound course of the beam determine your gyro heading and follow to the cone of silence over the station

Another method

An alternate procedure for solving the volume of signal orientation is illustrated in Fig 2 After turning to the outbound course of the approach beam as outlined above turn the volume down to a moderate tone and listen for the quadrant signal If an "N," turn to a course 30 deg away from the outbound approach beam course into the "N" quadrant. If an "A" turn 30 deg away from this course into the "A" quadrant. Continue to fly this heading without changing the volume control until you have a definite indication that the signal is *decreasing increasing* or that you are *approaching or crossing* a beam In finding your position by this method there is no necessity for a quick decision as to whether the signal is increasing or fading since you are flying in a direction which will not take you far from the beam on which you wish to return to the radio station Also as there is no need to make a quick turn or change of course, after you are on the proper heading, you may give all your attention to the signal to which you are listening

After you have flown the course chosen for sufficient time you will find one of three conditions taking place (a) the signal will be fading (b) it will be increasing, or (c) you will be flying in the twilight zone of a beam If the signal is unmistakably fading you have positively identified the quadrant, therefore turn directly to the beam, assuming its course as you approach the on course signal Establish the gyro course of the beam and complete your approach to the station (Fig 2 B B' B) If the signal is unmistakably increasing, continue on your course until you cross a beam whereupon turn to the outbound course of the approach beam (Fig 2 A A) When there is an indication that the signal is then decreasing, turn in the proper direction to get on the beam It is then advisable to follow the beam going away from the station until far enough out to make the proper reverse turn to come back in If you are approaching or crossing a beam after first starting the problem, turn immediately to the course of the approach beam as outlined above (Fig 2 A'). This method of orientation is positive and requires but little remembering of courses or solving of problems to determine quadrants or beams Important points to bear in mind the course (within nearest 5 deg of beam) on which you wish to fly to range station, the proper setting of volume control, the continuing straight course, how to distinguish increase, fade, or twilight zone of beam

Except in orientation, always follow the beam going away from the range if you are to make an approach over the station rather than to fly out in the quadrant and then turn back and get on the beam Check your gyro course going out (Fig 1) Ordinarily the distance should be at least 8 miles To come back, turn from the on course signal 30 deg. to the leeward of the outbound gyro course of the beam and hold for 45 seconds A normal 210 deg turn toward the beam will then put you back approximately on the beam The wind direction and velocity should be kept in mind at all times Always check your clock for the next broadcast before turning to come in on a beam

Following a beam

A beam should be flown as a gyro or compass course with the radio signals used to determine the course Many pilots in preliminary attempts to fly a beam by the turn indicator and compass endeavored to follow the on-course signal by a succession of abrupt corrections, first from the "N" side then to the "A" The gyro course of the beam should be determined by making corrections smoothly and deliberately but at the same time in a positive manner It is good technique to fly the beam with too few rather than too many corrections The first correction as shown in Fig 3 should be not less than 20 deg Each correction should be definitely held until an on-course signal is received and then the gyro returned to the course of the beam The second correction should be 10 deg and additional corrections 5 deg. Practice will enable you to limit corrections to 2½ deg upon reaching the last 2 or 3 miles from the range station The most common mistake in flying a beam is to over-correct the course, particularly nearing the station (Fig 3)

Crossing the silence cone

Whenever you use the cone of silence as a fix to begin to let down, always prove that you have crossed the range station by listening for the fade away of the built-up signal Due to mountains, swinging of the beam, or a faulty receiver, the radio signals sometimes fade, producing an effect somewhat similar to a cone of silence It is therefore always important to check the signal volume immediately after crossing the station This may be done after the glide is started before losing altitude below a safe limit. This decrease of signal will usually be very definite in a glide within 4,000 ft after passing the station

The safest approach to an airport from the range station is in a glide on a straight course ahead. Knowing the gyro course following the beam to the station you can lose the necessary altitude by continuing on the same heading after crossing the station The opposite beam can be checked by making the same gentle corrections as when approaching the station (where the beam crosses the airport)

The glide should be made under power, with wheels and flaps down at the normal gliding speed and rate of descent of not over 500 ft a minute The proper throttle positions should be set after crossing the station so that they need not be changed until the minimum safe altitude is reached

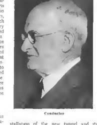
Navigation notes

When flying blind, or over the top, obtain all available information regarding weather conditions, wind directions and velocities before departure and while en route If practicable, after taking off check compass against known ground courses by land marks En route, take advantage of every possible check of your course and location It is important (due to characteristics of radio range stations) that a log of your compass course be kept when flying without visible reference to the ground between any two radio range stations or other points where your definite position can be determined. Even when flying the beam between two stations, a positive compass course, or a series of compass courses averaged, should be noted while checking on the radio range signals. Do not pass up any range station, beam intersection from an off-course station, marker, or ground station, that might identify your position. Check on each Compare your speed vs distance against those calculated. In approaching a range station from an open quadrant, or if checking in on the leg of a beam where there may be a possibility of intercepting either of two beams, always make a check by turning to the course of one beam and follow it far enough to positively identify it

Research Symphony

The Langley Philharmonic in Opus No. 10

Concert Master



Conductor

WITH Conductor Joseph S Ames insisting on inflexible adherence to tempo and Concert Master George W. Lewis getting brilliant performance from his individual group and solo performers, the Tenth Annual Engineering Research Conference of the National Advisory Committee for Aeronautics proceeded with all the smoothness of a major symphonic ensemble in action The audience was the aviation industry in numbers that strained the facilities of the isolated Tidewater Peninsular at Old Point Comfort almost to the limit. It is impossible within our space limitations to reproduce each nuance in the detailed development of every research theme That we leave to the extensive literature of the committee All we can do here is to give a brief recapitulation of some of the principal movements

Spinning Song

Most fascinating number of this year's performance was the demonstration of the brand new tunnel where model airplanes may spin freely in a vertically rising air jet of controllable velocity Most remarkable are the models themselves, miniature airplanes that are not only geometrically similar to their full scale counterparts, but also must have identical mass distribution and similar dynamic characteristics To add wonder to wonders, into each model has been built delicate timing machinery connected to controls to reset rudder, elevators, ailerons at predetermined intervals during spinning to promote recovery from the spin, or to change its characteristics To watch these intricate models swimming in the air stream like goldfish in a bowl, reproducing well-known spinning maneuvers as though under the control of a miniature human pilot, was an experience that few of this year's visitors will soon forget.

Thanks to Public Works Administration funds which made possible the installation of the new tunnel and its accessory equipment, the 800 factors which contribute to spins outlined some five years ago by Fred E. Weick, may now be subjected to exacting laboratory tests, reducing by many times the expense and the danger involved in full-scale spinning research

Wings, Crescendo

Long before the Department of Commerce undertook a program of private flying encouragement through equipment purchases, the NACA had been at work on the fundamentals of what makes flying simpler Five years of work on variable lift devices for lowering landing speed and on surer lateral controls had gradually split the boundaries of knowledge, and the conference revealed for the first time a new series of results.

Particularly important was the report of flight trials on designs so far tried only in the wind tunnel Flaps and variable area wings, generally considered only as a means of reducing minimum speed, are established on a new footing as proven aids to performance in getting off and climbing On a standard Fairchild monoplane, the installation of a Fowler wing (sliding a flap out of the lower surface of the wings to rear, and at the same time pulling it down so that both the area and the camber are increased) reduced take off distance from 500 ft to 330 ft in still air The total distance to clear a 50-ft obstacle came down from 910 ft to 720, the calculated distance to accomplish the same take-off and climb with a heavily loaded twin engine ship, from 1,500 ft to 840 On the twin engine take off, the use of a simple split flap without area increasing features would reduce the space needed for take off only from 1,500 ft to 1,100 ft

A trend toward variable lift devices of higher efficiency than the plain hinged flap a readiness to accept as necessary whatever mechanical complications their virtues might involve were plainly indicated in the report and their discussions by the engineers in attendance Area variation for example, is clearly a matter of practical interest for the future

Most elaborate and most effective of devices so far known is boundary layer control, sucking off the air from the surface of the wing into its interior through slots parallel to the span along the upper surface The committee's studies show that with a fixed wing with a single slot halfway back on the cord, burbling can be eliminated, a steady flow and a steadily increasing lift be maintained up to an angle of attack of over 50 deg, a maximum lift coefficient of 3.0 be attained with an application to

the blower of less than 3 per cent of the engine power That would make it possible to land at 55 m.p.h. with a wing loading of 23 lb per sq ft Even with a thin tapered wing well suited for high-speed use the same lift could be secured with expenditure of about 6 per cent of the total power

Interesting experiences with the handling of flap-equipped airplanes came out in the course of discussion The committee's pilots have found that if the flaps are pulled down suddenly to steepen the glide path in coming in over an obstacle, the immediate effect is exactly the opposite of what is wanted. The increase of lift by the flaps sets the ship to climbing above its original course, and with a light airplane fully 850 ft had to be covered before the flight-path dropped below the level that would have been reached if the flaps had not been used at all To overcome any such reversal of effect it was suggested that the flaps be pulled down to very large angles, as much as 80 deg where there will be a pure air-brake action with no further increase of lift One experimental machine of private owner type has been fitted with such a control for trial

Another way of increasing the lift, well known to test pilots trying to meet a minimum speed specification but seldom made the subject of research is by pulling back into a full stall and then opening the throttle wide to blow the slip stream across the wings and to carry a part of the weight directly on the propeller thrust Measurement on a typical plane in the propeller research laboratory at Langley Field showed an effective increase of 0.3 in the lift coefficient from such a maneuver a possible reduction of about 10 per cent in minimum speed

The effect of large flap angles on stability has proved to be bad throughout even when the flap extends over only a part of the span The Fairchild with the Fowler flap became longitudinally unstable both with free and with fixed controls at all speeds above 70 m.p.h. with the flap clear down Fortunately the stability characteristics prove to be best in the part of the speed range where the flap is most likely to be wanted, but at low speeds there is an extreme sloppiness of rudder control that requires as much as 11 deg of rudder to hold a straight course In some cases in fact the machine could not be flown at all at minimum speed with full flap effect because of the impossibility of keeping it straight even with full rudder

Mr McAvoy of the Committee's technical staff and Temple N Joyce debated flap landing technique and agreed that it differed from normal practice in that the machine need never be brought anywhere near a stalled attitude The drag being so large that the nose can be put down sharply without picking up much speed the angle of attack can be kept small until the very last instant of flattening out For that reason the abrupt collapse of the lift coefficient at angles beyond the burble-point that characterizes all flap arrangements makes no trouble in practice

The NACA slot lip control is a new and most promising addition to the long list of lateral controls developed especially for use in conjunction with flaps and to be effective beyond the stall A combination of slot and spoiler, it is a small flat plate lying flush with the upper surface and hinged at its forward edge So placed as normally to block very largely but not entirely the exit of air from a slot through the wing just forward of mid-chord its raising cuts down the lift with none of the time lag that marks the action of an ordinary spoiler

Drag; Diminuendo

Few of the committee's programs have been as extensive or as fruitful of practical results as the relentless pursuit of drag First notable contribution to aerodynamic efficiency was the familiar NACA radial engine cowling, then a long series of investigations on nacelle position interference correlated with more highly theoretical studies of air flow scale effect and turbulence

In the course of recent research the laboratories have dipped deeply into fundamentals without losing sight of visual manifestations of flow phenomena For example the smoke streamer studies of flow separation from airfoil bodies have revealed that a turning propeller in optimum position (tractor or pusher installation) improves the airflow in normal flight and at high angles of attack

Optimum position for engine installation has been found to be within the structure or in leading edge nacelles An ideal installation would have the engine completely enclosed in the structure fitted with extension shaft Rear extension of the shaft gives best net efficiency at low speeds but, at 200-300 m.p.h. this arrangement is worse than one with propeller ahead of the leading edge

Tests on in-line engine installation in wing-nacelle combinations have yielded slightly higher drag figures than for radials although it appears probable that with higher power concentration in a given nacelle conditions may be reversed

Bombshell for retractable landing gear advocates was the news that clean fixed landing gears had only slightly lower drag than fully retracting types In terms of top speed the difference was approximately 3 per cent Airline engineers pointed out in conference that 6 m.p.h. at the upper end of the range was the equivalent to 10 per cent power, asked for study of fixed landing gear effect on stability and spinning qualities Investigation of the take-off characteristics of airplanes with normal retracting gear extended as compared with fixed faired gears was suggested by T P. Wright

To run down the influence of various fuselage-wing combinations on drag and therefore on speed a series of tests was run in the variable density tunnel to determine optimum wing position with respect to fuselage Beginning with a bare fuselage with an uncowled radial engine in the nose and a rectangular wing in the best low-wing position refinements were added successively Engine cowling, wing root fillets, complete housing of engine in the wing adaptation of a symmetrical airfoil (rectangular then tapered) and finally a shift of the wing up to a high mid-wing position boosted the potential high-speed of the combination (for constant engine power) from 145 up to 205 m.p.h. The addition of a trailing edge flap naturally did not add to the top speed but gave, as would be expected, a greatly increased speed range

New sources of efficiency were promised by Eastman N Jacobs whose air-

White group studies power plants

Engineer Manufacturer Samuel Breese, William Littlewood (American Airlines) and D W Tomlinson (TWA) put some airline problems up to Ralph Damon (Curtiss-Wright)

foil family increases yearly Ideal offspring NACA 23012 is symmetrical has maximum camber relatively far forward. In such airfoils, maximum camber may be moved forward beneficially to 15 per cent of chord length, harmlessly to 5 per cent

Stresses, Giros, Boats; Miscellany

Heretofore the study of gust loads has been confined to effects on wings Recent flight research has indicated, however that gust loads on tail surfaces are much greater than has been

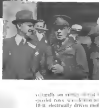
suspected Accelerometer readings give an average for the action of a gust over the entire wing span but since the wave length of the gust may be much shorter than the wing span the peak loads imposed by the gust may be much higher than the average recorded for the entire wing Where the wing may extend beyond the boundaries of a single gust wave, the shorter span tail surfaces may take the full gust impact On an O2H machine for example where an average wing gust of 15 ft. per second was recorded, simultaneous readings on the horizontal and vertical tail surfaces showed 33 and 45 ft per second gusts respectively An extensive investigation of tail loading to supplement the results so far obtained from acceleration readings on transport planes in actual service is now under way

Work with rotating wing systems although apparently not as active as a year ago still has a place in the research program Recent investigations have covered the selection of airfoil sections for rotor use also plan form modifications for maximum values of L/D Thus cambered sections show higher efficiency than the symmetrical types, for example, NACA 4412 was found to be some 13 per cent more efficient than NACA 0018 Although it was suspected that greater rotor efficiencies might be obtained by cutting out portions of the effective blade area near the hub experiment soon indicated not only that maximum L/D's were obtained with a full span blade but also that greater efficiencies might be expected from tapered plan forms where the chord at the blade root was considerably greater than at the tip

The ability of an autogiro to take off

Inventor Autogirist: Bill Stout tells Harold Pitcairn a few things about streamlined automobiles

Director Industrialist: Bureau Chief Eugene L Vidal covers some of the fine points of the D of C light plane program with Sherman Fairchild



Lawyer, Soldier: Ex-Assistant Secretary of Commerce William MacCracken discusses military tactics with GHQ Wing Commander H C Pratt

vertically on [illegible] speeded rotor was [illegible] tested with a 10-ft electrically driven model During initial rotation the blades were held at zero lift position then suddenly released to a high angle of attack position The model rose vertically to a height of 20.25 ft It was shown that the vertical distance attained during the initial jump is a function of disk loading Tests on the model showed that with a 392 ft per second tip speed and a disk loading of 2 lb per sq ft the initial rise is only 1 ft Cutting the disk loading in half, however, the initial jump goes up to 15 ft

The research program which led to the discovery of the beneficial effects of pointed main steps for flying boat bottoms (announced in 1934) was extended to cover steps of varying depths, and to study the effects of changes in the angle of ideal rise and after-body

keel Shallow steps were shown to perform better at low speeds, deeper steps at higher speeds Relatively flat afterbody angles (the range between 0 and 8 deg. has so far been investigated) appear more advantageous at low speeds low loadings Dead rise angles did not seem critical, however for the characteristics of similar hulls with bottom angles of 15 20 and 25 deg, were essentially alike

Most important result announced concerned the effect of various shapes of rivet heads in bottom plating By towing metal planing surfaces with a standard pattern of dimpled, brazier and button headed rivets, the advantage of keeping bottoms as smooth as possible became evident. The resistance of dimpled rivets was 5 per cent over the smooth plate, brazier heads 12 per cent, button heads 17 per cent

Power plants; Energico

Some twenty forms of NACA cowl with varying ratios of nose opening to overall diameter and rear gap area are being studied at full scale in the 20 ft tunnel Charts will shortly be available from which designers will be able to select cowl characteristics for all desired engine and flight conditions As suggested by airline operators who experience cooling troubles at normal angles and speeds of climb, the program will be extended to include range of angles of thrust line to flight path of from 0 to 10 deg.

Preliminary test results indicate that cylinder cooling at constant power output is independent of altitude as long as the mass movement of air over the cylinder is constant The cooling effect per unit of cooling surface seems to vary approximately as the square root of the airflow in terms of pounds per second per square feet of area covered

Studies of variation of cylinder temperatures with changes of cooling air temperatures indicate that the variation is linear, independent of brake mean effective pressure mass flow

Cooling fins should run at least eight to the inch, should be closely jacketed to force airflow to follow the fin and the wall closely The shape of the jacket and the size of the intake and outlet openings are being investigated not only for free air flow cooling but also for blower cooling

Interest in completely housed in engines for drag reduction prompts research in blower cooling Of chief interest is the cost of blower operation in horsepower. Some 30 to 35 per cent of total horsepower goes into the cooling of a bare engine, 13 to 16 per cent to cool the same engine with a properly designed NACA cowl Calculations based on skin friction of the average radial engine indicate that the absolute minimum of power required is about 1½ per cent of the total horsepower Therefore, the range in which blower designs must work is between 1½ and 13 per cent of the total horsepower On the basis of 65 per cent blower efficiency, the cooling loss should not be over 5 per cent

Where long range performance is required the low specific fuel consumption of the compression ignition engine is very attractive since 40 to 45 per cent of initial useful load of an airplane may be required for fuel alone. Work has progressed far enough to indicate that it is possible to obtain the same power for the same displacement and r.p.m. for carburetor and for compression ignition engines with reduction of specific fuel consumption of some 20 per cent

Shape of combustion chamber affects the efficiency of compression ignition engines. Spherical or disk type mixture chambers were found not as effective as a new displacer type recently developed by the laboratories A solid boss cast on top of the piston projects into the mixture chamber at top dead center, causing a high velocity air flow in the narrow clearance between boss and sidewall and great turbulence in the chamber at the instant of fuel injection

Among questions submitted for consideration of the committee Best cooling arrangement for six cylinder in-line engines? How can airflow inside an NACA cowl be restored to the outside flow most efficiently?—through an open slot or through louvres?—is it permissible to support the skirt of the cowl on the fire wall? Are internal guide vanes permissible? How may the accessories on an in-line engine best be cooled? What is the effect of a propeller spinner on the cooling of an in-line engine? How best to cool a flat engine—where to take in the air, where to discharge it? What is the drag of openings such as the ends of exhaust stacks, facing aft?

Propellers; Vibrato

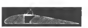
Resonance with frequencies originating in the engine rather than aerodynamic flutter is now recognized as the cause of vibrations frequently leading to fatigue failures in propellers It is demonstrable that true flutter can occur only at speeds far in excess of the speed of sound The natural frequency of a rotating propeller is quite different from one at rest, due to the blade tension induced by centrifugal forces For full scale propellers, therefore, vibration analysis by accoustical methods becomes the only practical method

A method of scaling down propeller vibration effects for study was shown A propeller of full scale diameter was prepared with the aluminum alloy blades reduced to one-tenth normal width and one tenth normal thickness. It is mathematically demonstrable that the vibration characteristics of such a propeller when rotated at one tenth normal revolutions per minute are exactly similar to those of the normal propeller at normal speeds It is therefore possible by rotating the propeller (with blades completely enclosed in streamline tubes, to eliminate all air effects) and imposing at the same time axial vibrations of known frequencies on the hub, to determine the resonant frequencies of the modified blades Results scale up to full size by simply multiplying all data by ten

It was stated that undesirable resonances had been eliminated in some cases by changing the mounting of a propeller from a position parallel to the engine crank throw to one 90 deg. away, but the desirability of such a method of correction was seriously questioned by propeller and engine manufacturers

A new light on the composition of propeller noise was obtained by filtering out certain frequencies (or combinations of frequencies) from the sound picked up by microphone 50 ft away from an electrically driven full scale propeller It was evident that the troublesome ranges were (1) the higher frequency harmonics and (2) the vortex noises which produce the characteristic tearing sounds emitted by a propeller at high speed It was shown that the basic frequency filtered out from all the super-imposed harmonics and vortex noises was a musical note of low pitch This is the note normally heard by an observer at a relatively great distance The unpleasant frequencies are filtered out by the intervening atmosphere. This effect was produced electrically to conclude the demonstration.

Trolley ride

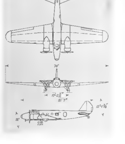


NACA slot-lip aileron

Airflow in smoke

Boeing Transport

Continuing our studies of the structural characteristics of outstanding American airplanes, consider the Boeing 247D, which out-performs its predecessor 247 by a substantial margin.



TO ADD 18 m.p.h to the average cruising speed of its entire fleet of airplanes—a project of no mean proportions—is the task recently undertaken by United Air Lines Of the 70 Boeing transports purchased by United since 1933, the last ten were Model D's Appearing on the line late in 1934, they have shown so much promise that the 247s are being rebuilt in accordance with the new specifications The job of conversion has been assigned to the Cheyenne overhaul base, to be handled along with regular maintenance operations during the current spring and summer The necessary men, materials, and machinery have now been concentrated at Cheyenne, and it is planned that by early Fall every ship on the line will have passed through overhaul at Cheyenne and will have emerged in revised form

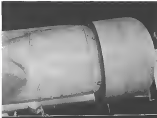
The most fundamental change involved is the substitution of geared, supercharged S1H1-G Wasps of 550 hp swinging three-bladed controllable pitch propellers for the former S1D1 engines with the two bladed controllables Nacelles have been completely redesigned, being of much larger diameter and having a full NACA cowl in place of the former relatively narrow speed ring All engine accessories are completely enclosed thus eliminating the familiar oil cooler "humps" of the 247 A small series of louvres set flush with the top surface of the nacelle is the only evidence of the location of the oil radiators on the new ship

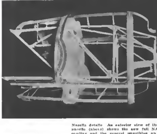
Except for the modified nacelles, external changes are rela-

tively few Most obvious is the rearranging of the cockpit enclosure changing the slope of the windshield from forward to aft The aileron trimming tabs have been increased in span, and the rudder tab divided into two parts which function independently, one controllable from the cockpit to provide trimming in yaw (for one-engine-dead condition), the other serving as an aerodynamic balance to lighten rudder forces, hooked up as indicated in one of the accompanying sketches The basic structure remains unchanged, but long demonstration of high strength factors both in service and in static tests subsequent to those made originally have justified an extension of licensed loads for the D models to 13 650 lb gross, including 2,582 lb. of payload with fuel for an 800-mile cruising range

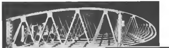
The result of the external changes and the increase in power has been a gratifying improvement in performance Top speed goes to 200 m p h , cruising to 189 m p h at 12,000 ft or 180 m p h at 8,000 ft Initial rate of climb with full load is 1,150 ft per minute; absolute ceiling 27,200 ft. Single engine performance is outstanding, for, fully loaded, the new model can be climbed to an altitude of 11,500 ft compared with the single engine ceiling of 4,000 ft. of the *247*

Ever-increasing demands for passenger comfort have been met in the *247*D with a new type of chair with improved head-rest, and reduced noise level, due to lowered propeller tip speed and a new ventilating system The old direct opening ventilator on each window has been replaced by centrally located fresh air intakes with outlets both along the ceiling and at the base of the cabin walls Air can be completely changed every 45 seconds.



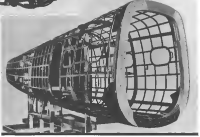


Nacelle details An exterior view of the D nacelle (above) shows the new full NACA cowling and the general smoothing up resulting from housing oil coolers, generators etc., inside Note combination carburetor hot air stove and cabin heater stove along under side The uncovered structure (below) shows the electrically welded engine mount and the cowling supports faced with leather strips The mount attaches to the center section spar by means of taper pins

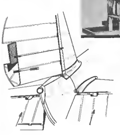


Wing structure Above the all-metal, cantilever structure of the outboard wing panel. Taper bolts connect each panel to the center section, detail of which is shown below Note the new formfitting wheel well, a modification which is designed to reduce air disturbances around the retracting under-carriage to a minimum. Corrugations in the wheel housings add strength dampen vibration

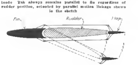
Performance data and specifications for the Model D include Landing speed, 62 m.p.h., climb in ten minutes from sea level, 11 000 ft, wing loading 18.2 lb per sq.ft., power loading 12.4 lb per hp, weight empty, 8,940 lb, useful load, 4 712 lb.; fuel capacity, 273 gal.; oil capacity 20 gal.



Fuselage and center section Fundamental soundness of Boeing fuselage design has been demonstrated by millions of flying miles and exhaustive static tests This uncovered view of the rear section of the fuselage shows arrangement of bulkheads, former rings, stringers etc The section of front spar (above) shows method of carrying wing stresses across the fuselage Note also points of attachment of retracting landing gear and engine mount fittings Spar chord members are of steel tubing, webs and gussets of duralumin



Tail trimming tabs The 247D carries the familiar longitudinal trimming tabs controlled from the cockpit in the trailing edges of the elevators but the single trimming tab in the rudder of the Model 247 has been replaced by a double flap arrangement. The lower tab is controlled from the cockpit and takes care of unbalanced power conditions Upper flap is an aerodynamic balance to reduce rudder loads Tab always remains parallel to fin regardless of rudder position, actuated by parallel motion linkage shown in the sketch



"You Have to Make Calls

—if you want to get results," is the philosophy of dynamic Distributor Ailor whose Roosevelt Field business has been built on the sound belief that sales are made in direct proportion to energy expended by the sales force. Here he tells how he sells more planes each year than the year before.

By Howard T. Ailor

President Waco Sales of New York, Inc.

This desk knows the feel of freshly signed checks

These matches made a job for an extra stenographer

Ailor cornerstone

DISPLAYED conspicuously as the caption for a cartoon hanging on my office wall, and inscribed indelibly in the consciousness of my associates and myself is the homely slogan (slightly paraphrased), "You have to make calls if you want to get results." This simple sales philosophy is the cornerstone of our organization. It would apply as well to merchandising sales or yachts or goldfish. There are no fundamental differences in the problems that arise in selling airplanes. But making the calls is not all the battle. First you must have someone to call upon, then you must have something to show when you call.

A curious Roosevelt Field saga has grown up around our company—a belief that one of us rushes out to greet all comers by car, foot, or airplane, bursts forth with a sales talk for Waco. This is not actually the case but rarely do we leave a stone unturned in seeking prospects, rarely is there an idle moment in my office.

Seek and ye shall find

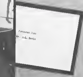
No expense is spared in tracking down prospects and every one who shows the slightest interest gets a copy of the catalogue and factory house organ. Even the scrawled longhand letters that come to every manufacturer and dealer from bereaved boys whose grandfathers have just died and left them fortunes are answered carefully. Requested catalogues are sent. Naturally we know these catalogues soon will take their place among the trophies that adorn the walls of someone's den but we also know that prospects and sales have come from just such sources. One commission will pay for many catalogues and letters.

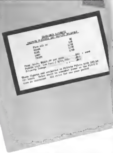
Only individual ingenuity limits the ways and means of tapping the untouched sources of aviation interests. Last year we tried an experiment in direct mail advertising. One million match books with inside cover coupons were distributed through the regular advertising outlets of the Ohio Match Co. Result: It became necessary to add a stenographer to our clerical staff to send replies to a daily mail increase of 50 inquiries.

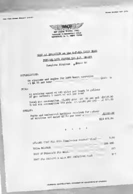
Direct mail activities however, have not been confined to match box methods. We have circularized the Department of Commerce student permit and license lists with some success. Costs of this source of prospects have been high and at present we look with greater favor on direct contacts with flight instructors who assist in making sales. We also use newspaper and business paper space extensively.

Charter passengers constitute a group of highly developed, half sold buyers. Spotless ships and businesslike service frequently make such an impression that orders often are taken without the usual formality of a study of competitive offerings in the same price range. Many a good lead comes from our service department which has a dual purpose: (a) to recondition trade-ins, (b) to discourage extensive repair work on old ships, promoting sale of new ones.

Every ship that taxis up to the line







Sales climax: Pages from the Ailor presentation with its personalized appeal.

has a red service card immediately attached Requirements are checked and certain free operations are automatically performed No matter how it hurts, the ship is gassed and ready for the owner to step into when he wants it Even a direct telephone wire is maintained so that calls from New York City can be made within the local toll charge Our service department functions with the regularity of hours of a practicing physician Night calls are frequent Customers usually remember where they got unusual or extra service when they are in the market for a new ship

Although we give instruction on request the payment for it often constitutes a deposit on a ship sale. We offer free use of our instructors for those who purchase our equipment. To reach the purchaser of moderate means, we preach the doctrine of group plane ownership Four men who learn to fly in one of our thoroughly reconditioned used planes are four perfect prospects for used or new ships next year Naturally we cannot teach all members of a group to fly, but we are willing to pay the expense of one course to solo for each plane we sell Thus we create tomorrow's owners

Give him what he wants

After a new ship prospect has given evidence of serious interest in the purchase of a plane (salesmen can always tell) we make a study of his personal requirements, power plant preferences, performance expectations One job is to learn his favorite color If he represents an organization with a trade mark or specific advertising colors (oil companies for instance) this job is easy If not, we must resort to strategy Then we are ready to make our presentation

Our sales prospectus is a document of which we are justly proud We believe it to be one of the most colorful and complete of its kind in the aviation business This is not boasting We make it true

Bound between the most attractive covers (blue) that can be bought are seven equally attractive leaves fourteen pages Immediately on opening this book the prospective buyer is greeted by the appearance of his name on the first page

Imagine his enthusiasm when, on turning to the next, he finds a beautifully water colored picture of his favorite Waco It happens that the colors and striping are just the ones he wants

At this point reality stalks forth in the mind of any business man What will it cost? What about insurance? The answers will be found on the next pages He turns and there it is Page four is devoted to a brief but complete insurance estimate, written in his own language (dollars), not the complex jargon of the underwriters But insurance is only one item of expense. The others are on page five. Depreciation (1 500 hr), fuel and upkeep costs are generously estimated Hourly and mileage costs are plainly shown He is amazed to find the costs compare favorably with those of his automobile

When automobile comparisons enter the picture it is only natural that his thoughts will turn to maintenance The next spread is devoted to discussion of servicing facilities and the impressive list of all the Waco service stations in the country Lists of industrial and private owners follow and next comes an ordinary color chart for the use of those whose preferences as to finish have not been found The last spread is devoted to upholstery samples and the inside back cover has a pocket for catalogues price lists, and other literature Only things not included in the presentation are the contract and the check

All this sounds expensive and it is The chief cost item is the empty book The name inscription is typed on

an attractive sticker, pasted on the page The outline drawing of the ship is done in water colors by a versatile member of our office staff. All of the other information is typed on our own stationery and pasted on the pages Color chart and upholstery samples are furnished by their manufacturers

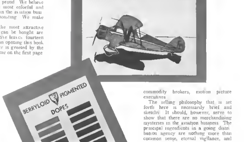
Shortly before or after the advent of the sales presentation, the prospect is invited for a demonstration flight By this time, salesmen's intuition has determined the degree of interest. Flights of this type are rarely wasted Even rainy days are busy ones in our offices Telephone solicitation of prospects, invitations for flights are punctuated by frequent orders for parts, accessories

A show of our own

While the industry is debating about where or when to hold a show, or not to hold a show, we have one of our own Our annual preview of new models has proved itself well worth the time and money that it costs There is a festive air about our main hangar when it is decorated in bright colored bunting grass mats on the floor, and shining ships roped off and placarded Here lies an opportunity to get our prospects on the grounds, for them to see our latest models under ideal conditions And here sales are made in gratifying numbers There is no better place to sell than at your own home hangar

Most understanding prospects are those who are themselves engaged in selling accustomed to personal contacts in their work Examples Oil companies, commodity brokers, motion picture executives

The selling philosophy that is set forth here is necessarily brief and sketchy It should, however, serve to show that there are no merchandising mysteries in the aviation business The principal ingredients in a going distribution agency are nothing more than common sense, eternal vigilance, and constant service



Two more pages from the Allor presentation On page 2 the prospect discovers a picture of his preferred plane in his favorite colors For those who are not color conscious, a chart is included

Power Control and Schedule-Keeping

The Pilot's Viewpoint

By Edmund T. Allen and W. Bailey Oswald

In a series of articles in AVIATION *extending over the past year Messrs Allen and Oswald have developed a comprehensive theory of ideal control in cruising conditions in transport operations The work so described has had a profound influence upon airline operations, their methods have been categorically adopted by a number of transport companies, and a great deal of experience has been accumulated under practical operating conditions No matter how beautiful the theory, its reduction to practice is in the hands of the men who sit at the controls, and their interest is less in generalization than in the practical working of the method on a particular route That is the problem to which the authors have now addressed themselves and they present a pilot's-eye-view of some of the everyday problems of schedule keeping*

IN APPLYING any theoretical analysis to an actual operation, discrepancies crop up In airplane practice, the gap often seems to be exceptionally large One reason may be that the difference between airplane maximum power, used for tests but never in operation except for emergencies and "cruising" power used for actual operation, is large, another may be that the effect of a very small delay in starting or a waste of time at any point becomes so important, especially for short trips, that it may quite invalidate any theoretical conclusions, still another may be that all of the principal variables were not taken into account in making the original analysis It has become a common belief that flight-test results can never be relied upon when an airplane is put into actual service Too often it is not service technique such as the airline pilot uses and attempts constantly to perfect, which prevail during the test, but some practically unattainable ideal

This question of large discrepancies between the ideal and the actually realizable arises also in putting into use a new mode of flying, radically different in nature from former usage and comprising a complete control over flight-path and operating conditions How great will be the residuum of difference between prophesied results and actual experience when this technique is put into operation? And among what impracticalities or failure to take necessary elements into account should this residuum be apportioned?

Why schedules are not kept

When both the new airplane and the new technique are put into operation on an established airline in which the schedules have been set up for the anticipated speed based on the theoretical analysis, the pilot, after finding that he cannot meet the schedules without exceeding the cruising limitations set up for the expected reliability, is often unable to determine whether the difficulty rests with the schedule, the airplane or the technique In attempting to resolve this difficulty, or to discover if there be a solution short of modifying the schedule, schedule analyses have recently been made on two airlines In one case it was disclosed thet for certain stretches of the route the expected speeds were unattainable at proper cruising powers In a former article (AVIATION December 1934) trip-length was found to be an extremely important factor in influencing average trip velocity Figures 42 and 43 of that article illustrated graphically how average trip velocity is reduced as the length of the flight is reduced If this factor is not taken adequately into account in schedule making the resultant discrepancies may be disturbing Block-to-block velocity on which schedules are built is of course markedly lower than average trip-velocity in the air the difference is as great as 20 m p h for a 200-mile trip at 70 per cent power with a ten-minute delay in taxiing take-off, circling and landing

When we reach this point, we have to study the individual route as a distinct problem taking all its characteristics of terrain, of meteorological conditions and of schedule into account That is the necessary preface to any proper analysis of schedules Block-to-block trip charts serve both as a guide to the pilot for carrying out the flight on schedule at minimum power and as an aid in schedule-making A sample of such a simplified trip chart for a short trip is shown in Figure 63, where pressure altitude is used for the ordinate-scale Pressure altitude has the advantage of simplicity as it can be read directly from the altimeter, and it is near enough to the true altitude in terms of which wind-aloft information is given so that no serious error is likely to result from the difference in interpreting the meteorological information For comparison there is shown in Figure 64 a simplified trip-power chart for a longer trip length. It is apparent that block-to-block velocities here are much higher Wind vectors were made from a chart such as was shown in Figures 48 and 49 (AVIATION, January, 1935) and plotted directly on the trip-chart as shown in the example here given When the distance is short, as in this case, a single upper air wind sounding or possibly two, give sufficient accuracy. The method shown by the charts has proven useful for finding the best cruising altitude. After finding the power required at that altitude, the pilot refers back to the cruising chart to determine the engine operating conditions for the desired output. If the atmospheric temperature at the predetermined pressure altitude is above standard, a further saving in power is possible while still maintaining the predetermined cruising velocity required, as the increased temperature reduces the air density and the power needed to maintain the desired speed. Figure 52 (AVIATION, January, 1935) may be used to combine these two computations Figure 52 does not, however give block-to-block velocity or time A separate special trip chart for each section of a route with its individual

length, altitude of take-off, altitude of landing, mountain ranges to be crossed, wind conditions, and scheduled time, is needed for that purpose The meteorologist and the pilot together may plot directly on this chart, just prior to the start of each flight, all available weather information

If it has appeared impossible to keep scheduled times without exceeding operating limits the schedule may be analyzed in a different manner It was found on one line that a schedule for which 75 per cent power output was apparently not sufficient on part of the route could be accomplished theoretically at 65 per cent cruising and descent power and 70 per cent climbing power The questions arose at once Where is this waste going? Why are we using a 300 000 engine mile reliability when we could make the total schedule with probably 500,000 engine miles per engine-failure? (See AVIATION, March, 1935). Why are we using 100 gallons of fuel per hour when we might be saving 10 to 15 gallons per hour? The answer to such questions usually lies largely in the fact that flying cannot be controlled, and maintained at a theoretical ideal, without regard to weather conditions Operating between Buenos Aires and Mendoza (Panagra) for example, it costs far more in fuel, wear and breakage to make a scheduled flight at 3,000 feet altitude than to climb to 11,000 feet altitude and descend in the ideal manner as shown in Figure 64 Frequently, however, it is not possible to fly at 11,000 feet. Ice formation conditions may force the airplane down to 4,000 feet and necessitate increasing the power used by 12 per cent (or 7 per cent of maximum rated power where the cruising power factor is 60 per cent) in order to meet the schedule The explanation of mysterious losses of time may, however, be found in a different quarter The schedule may require an adjustment of fast and slow sections, a possible elimination of a stop a careful check on the losses due to ground delays Readjustment may make it possible to curtail the use of excessive cruising power on long sections of the route.

Scheduled departures rare

When the attempt was made to operate an airline on schedules made in this manner and to utilize the trip velocity wind-vector charts for block-to-block operation, it was found over a period of months that it was easily possible, after minor difficulties were ironed out, to predetermine the cruising power required for arrival on schedule time with any combination of wind and flying conditions. With accurate upper-air wind data provided, trips in which the power-plant was operated and the speed and altitude varied in accordance with the specifications calculated in advance were regularly completed within 2 per cent of the computed time

Scheduling problems begin to be apparent when the plane taxis to the loading platform With every change of phase during the flight new sources of possible waste and error present themselves A special campaign must be made against each one and the first step is to line them up for examination.

Departure on schedule is seldom accomplished. It has been found difficult to get passengers to start boarding the airplane five minutes prior to scheduled departure time, but unless this is done the departure will usually be five minutes late. Last-minute farewells and adjustments in the cabin prior to closing of the door occupy five to eight minutes on the average If the engine on the entrance side cannot be started until the door is closed, another one or two minutes are wasted in warming up When these operations are timed we see how necessary it is to stop the small losses occurring during departure as well as those chargeable to inaccuracies of computation and execution of an operating plan for the flight If the time when the blocks are to be pulled away from the wheels is the scheduled departure-time then plane announcements must be made correspondingly early The periods of time for taxiing to the end of the runway, running up engines, turning the airplane to face take-off awaiting the take-off signal on a crowded airport, and actual taking off, including an average quarter-circle of the field to get on course, mount up to far more than is usually supposed Figure 65 has been drawn to show the amount of additional power that is required to make up time on a schedule retarded by small delays It shows the percentage increase in the power actually being used, as opposed to the percentage increase in rated power, and establishes the necessary increase in some cases at an alarmingly high level It appears from this figure, for instance that if it is necessary to wait one and one-half minutes for the take-off signal, and if it is impossible to make that time up in savings from the circling and ground time allowed on the schedule, the power used would have to be increased 10 per cent throughout a 130-mile trip, in climbing, in cruising, and in descent, in order to arrive on scheduled time.

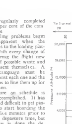


Fig 63 Panagra Douglas cruising trip chart Block to block trip time as a function of altitude and cruising power Average velocity includes taxiing take-off, climb, cruising, descent, and circling for landing. Determination of power required for flight against head winds at various altitudes is illustrated by the line superimposed on the chart

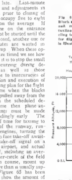


Fig 64 Panagra Douglas cruising trip chart Block-to-block trip time as a function of altitude and cruising power Average velocity includes taxiing take-off climb, cruising, descent, and circling for landing

Take-off technique

Take-off technique is studied with reference to its effect upon the maximum efficiency of the entire operation Safety, reliability, and time-saving in that order of importance appear to be the three elements which require an intelligent adjustment between maximum allowable take-off manifold pressure and minimum safe take-off run and climb Attainment of a safe position and condition in the air is desirable as soon as possible, without, however, utilizing a manifold pressure so high as to decrease in any degree the desired reliability The tendency on the part of the pilot to maintain a high initial climbing power for a minute or two after take-off is decreasing because we are realizing that the gain in altitude that results is more than offset by the increased chance of power plant failure under those conditions Normal climbing conditions ought to be established almost immediately after take-off, the course can be reached with the minimum circling completed as quickly as is consistent with passenger comfort, and the steady climb continued at optimum conditions for the engines and greatest passenger comfort.

The climbing path is fixed with primary reference to power-output, with due attention also to passenger-comfort, which is an important factor determining our decision as to rate and angle of climb The charts in Figures 35 and 36 (AVIATION, January, 1935) have been found somewhat difficult to follow in controlling power, because conditions are changing so very rapidly during the climb So many things are then demanding attention that a simplified form of pilot's climbing guide has been found desirable, even though it involves an error of a few per cent in power control Such a chart is shown in Figure 66, in which manifold pressure is used as a primary control to fix any desired power during a climb at a specific constant indicated airspeed Using a climbing power 5 per cent higher than cruising and descending power, the correct climb can be controlled by glancing at this manifold pressure chart, which is intended to be permanently installed in the cockpit Low pitch is maintained in the ideal climb at 100 m p h indicated velocity until engine-revolutions rise too high for the permissible climbing limits The limits vary with power, as shown in AVIATION for March, 1935 They may be approximated by noting the points in Figure 66, where the manifold pressure lines on the climb-chart break back to the higher figures used after the transition into the stage of high pitch climb at 130 m p h

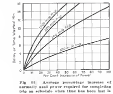


Fig 65 Average percentage increase of normally used power required for completing trip on schedule when time has been lost in some portion of trip

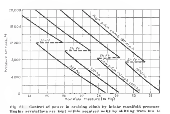


Fig 66 Control of power in cruising climb by intake manifold pressure Engine revolutions are kept within required units by shifting from low to high pitch as altitude increases (Douglas DC-2.)

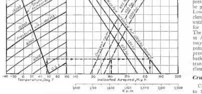


Fig 67: Descent chart for 300 ft. per minute cruising power descent Power is controlled by indicated velocity and r p m. through density altitude scale Example: For 70 per cent power—800 ft per min Descent at 8 000 ft. pressure altitude and 50 deg F. temperature, adjust air speed and throttle to obtain 164 m.p.h and 1,810 r p m (Douglas DC-2 Hamilton standard controllable-pitch propeller set in high pitch at 32 0 deg)

Cruising altitude

Cruising altitude is determined prior to the flight from the meteorological data and the trip chart. It may be necessary to modify the decision then taken, if meteorological conditions are found unfavorable when the predetermined altitude is reached In normal weather, however, trip length, winds, airplane speed, and schedule or cruising power factors will have determined the leveling-off altitude Unless specific conditions counsel otherwise, this cruising altitude had best be closely maintained, since any variation from the ideal flight path involves a loss of time or waste of power Power can be controlled easily from the cruising chart made for the particular propeller used

It has been found in practice that neither tachometers nor manifold pressure gages maintain their calibrations very long Their aberrations are usually caused by remediable items, such as dirty brushes or oil accumulation in the gage line The pilot ought to judge from time to time of the correctness of his instruments, and guess which instrument, if any, is reading incorrectly, by observing the behavior of the other variables in the flight condition. This problem of judging which instruments are momentarily incorrect is a difficult

one. The guide chart shown in Figure 30 (AVIATION, October, 1934), where indicated airspeeds are used for power-control, simplifies such judgment It may make possible checking both the tachometers and the manifold pressure gages

The beginning of the descent is one of the most important points of the operation, because any delay here is a pure loss of time equal to the loss of a delayed start The time consumed in descent is fixed by passenger comfort; any delay in the time of beginning it represents a total loss If the descent-rate is limited to 300 feet per minute by a local ruling, the proper point along the cruising flight path at which to begin the descent can be determined by a simple computation for any altitude, descent velocity, and wind The descent may require 120 miles or even more for average cruising altitudes If the proper point for starting down is in fact 120 miles from the destination and if the mistake be made of continuing at cruising altitude to within 70 miles of the landing-place the loss of time will be approximately 15 minutes since the airplane will arrive over the destination at 4,500 feet altitude and have to expend this altitude in circling This 15-minute delay cuts down the scheduled trip speed for a 250-mile flight from 165 m p h to 142 m p h resulting in a 17 per cent increase in trip time. Experience will aid in making this part of the flight so perfect that the pilot will eventually arrive always at his terminal at just the right altitude and position.

Power control in descent

Power control during descent has been found more difficult than was anticipated because of the constantly changing flight conditions and the fact that attention is constantly being distracted by the other tasks during this part of the flight A new guide, therefore has been constructed. This is shown in Figure 67, where indicated airspeed and engine revolutions for any desired power during constant rate descent are plotted against pressure altitude and temperature, the former being the primary variable with a correction to be made for the latter. The airspeed indicator offers a far more satisfactory method of smoothly and accurately controlling the descent than the rate of descent indicator, because the rate of descent fluctuates widely with the smallest oscillations of the flight path or movement of the controls, while the air speed has a certain time lag of response to such small changes and its guidance follows a smoother curve Almost any attempt to fly with a sensitive rate-of-descent meter as a primary guide results in passenger discomfort on account of the frequency with which abrupt corrections have to be made to keep up with its hidden changes of indication.

As can be seen from Figure 67, all that is necessary, when nosing over from the level cruising part of the flight at 70 per cent power at 12,000 feet density altitude into the descent part of the flight is to allow the indicated airspeed to rise from 157 to 168, adjusting the throttles back to hold the engine revolutions at 1,920 When airplane attitude and engine operation have become stabilized in this descent-path, the rate-of-descent indicator may be observed to see if it averages approximately the desired 300 ft. per minute (If a different limiting rate of descent is desired, a similar calculation would of course result in different figures for airspeed and r p m) If it remains too low, the throttles can be closed slightly and the indicated airspeed maintained at 168 (or 169 by this time, since some altitude is already lost) by nosing over into a steeper descent-path Thus the flight can be controlled most easily by maintaining the indicated airspeeds along the desired power line of this graph, checking occasionally to see if the proper rate-of-descent is being held true

A guide for descent operation based upon manifold pressures (like that given in Figure 66 for climbing conditions) rather than upon airspeed and engine revolutions can likewise be constructed, if desired A chart of that type offers the advantage of more easy reading because it is based upon pressure altitudes rather than density altitudes and so requires one less step for its interpretation

Differences in calibration of the airspeed indicator on different airplanes of the same production-group have been found to be relatively unimportant in the guidance of this portion of the flight

To avoid misunderstanding, absolute horsepowers instead of percentages of rated power have been used on the graphs for this operation This change in labeling has the advantage of applying to other engines in the same airplane so long as propellers and propeller pitches are unchanged At a given airspeed and with a given propeller and given pitch setting the air consumption is always the same for the same propeller r p m and the same air density regardless of what kind of a power plant is turning the propeller. Having found out how much power can be used without getting an excessive rate of descent the propeller r p m allowable becomes utterly independent of the power plant The manifold pressures, however will not necessarily remain the same for different engines, since the manifold pressure to supply a given power at a given r p m depends on the engine design. For instance, if the F-3 Cyclone is changed to the F-2 by modifying the blower gear ratio and if the propellers are unchanged, the cruising charts will be usable for the new engine installation by reading the same revolutions and approximately one inch lower manifold pressures than those shown on the chart made for the F-3 engines

Physiological considerations

Passenger comfort during descent has always been considered reasonably safeguarded by restricting the rate to 400 ft per minute. The reason for the discomfort experienced by certain passengers at higher rates of descent is that the eustachian tube connecting the inner ear with the pharynx sometimes becomes clogged by inflammation or mucus and does not allow a free pressure leakage from the gradually increasing cabin pressure during descent to the static tympanum pressure. When this tube is sufficiently inflamed to cut down leakage to a very small amount, the differential of pressure on the ear drum bends it inward. Most pilots do not notice any sensation in descents ten times as rapid as the maximum considered comfortable for ordinary passengers. In diving with a rate of descent as high as 100 times the maximum rate considered comfortable for passengers, the pilot still feels no discomfort because his eustachian tube is open. Since it is, however, necessary to avoid discomfort to any passengers, whatever their physical state, it is well for the pilot to bear in mind just what the cause of this pain is. It is sometimes advisable for him to instruct passengers who feel discomfort to "blow out their ears" or to stretch the mouth in a yawn or to swallow, meanwhile governing the descent of the airplane in such a way as to minimize discomfort. A high initial rate of descent will cause no pain whatever until the pressure-differential builds up a process usually requiring several thousand feet. This has been found true in practice. A steep descent is allowable for a moderate distance. When a leakage of pressure through the eustachian tube once begins however any particular individual with a given degree of stuffing-up of the tube will experience the threshold of discomfort at a fixed rate of pressure change. This constant rate of pressure-change does not correspond to a constant rate of altitude-change at all altitudes, since 300 ft per minute at sea level is equal in rate of pressure-change, and so its discomfort-producing possibilities, to 460 ft. per minute at 14 000 ft altitude.

Passenger-comfort is of paramount importance in all operations. On the highly efficient descent portion of the flight in which the potential energy stored up in climbing is partially reclaimed, passenger comfort is somewhat opposed to maximum efficiency. Efficiency here must be sacrificed to the extent necessary to give the passengers a pleasurable flight. Once the maximum allowable rate of pressure-change has been determined upon, it is desirable to maintain this path steadily from cruising altitude all the way down to landing approach It is a problem facing each pilot to effect the transition from the aerodynamically efficient descent to the aerodynamically inefficient approach in the manner that will sacrifice the least possible time On some airlines it is proposed to terminate the descent at 500 feet altitude directly over the airport, following this arrival with a circle of the airport after the wind direction has been determined from a view of the wind indicator. Such an approach consumes five to eight minutes Several alternative methods of making the approach to landing have been tested with different ground winds it has been found that a saving of half the usual approach time can be regularly effected

The most effective device is to deviate from the regular course while far enough away from the destination so that the deviation will not lengthen the flight distance appreciably and can have no disturbing effect on local traffic, the deviation being such as to take the machine to leeward of the airport and permit a single turn onto the final up-wind course for the landing approach This is most effective when the wind appears to the oncoming pilot on his original true course as blowing from right to left across the field The average saving so made may increase block-to-block velocity on a 200-mile trip by as much as 13 m p h Alternatively—applying the chart of Figure 65—it appears that in order to keep schedule in spite of this redeemable loss, the expenditure of 17 to 34 per cent over the power normally used would be necessary

The other problems standing in the way of a satisfactorily efficient transport operation can in most cases, it is believed, be similarly analyzed and dealt with The most important, engine-control, has been solved It is now possible to avoid on one hand the Scylla of the over-timid, and therefore inefficient uneconomical, use of the legitimate resources at the pilot's disposal, and on the other the Charybdis of uninformed overstrain of the mechanism, resulting in reduction of reliability and hence in financial loss We climb, cruise descend, under predetermined and controlled conditions We are geared to the wind in utilizing its vectors to achieve minimum power expenditure and maximum economy Even the take-off is defined as to power conditions to be allowed, and the landing-approach is scheduled as to time loss The engines are coming under such careful supervision and analysis that we may soon predetermine the number and the nature of engine-failures by applying statistical methods to engine-reliability data And it is indeed significant that most air transport lines are now beginning to develop their operations systems in the light of this optimum cruising-altitude method of power control

Advertising the Air Mail

This Neon-lighted air mail box placed at a busy intersection of downtown San Antonio has increased local use of air mail by some 85 per cent

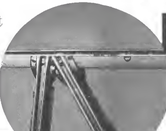
THAT air mail poundage is susceptible to improvement through advertising has been given practical demonstration by Postmaster D J Quill of San Antonio, Texas Conspicuous on a busy downtown street corner stands a regulation U S Air Mail box with the familiar red, white and blue banding Here similarity to other boxes ends, however, for above its rounded top appears a large and brilliantly colored Neon-lighted sign Illuminated on an average of 18 hours per day, it indicates rates and the hours of collection for all mail schedules out of San Antonio The sign cost just over $70 to build The cost of electricity is met by a group of local business men, as the government provides no funds for such purposes

The box display supplemented by radio talks and personal contacts, has increased the Air Mail poundage out of San Antonio some 85 per cent over former levels, a record increase for the State of Texas

Stainless in Aircraft

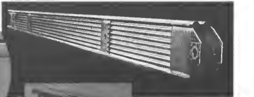
Chief engineer of a company whose primary interest for over ten years has been the application of electrically welded stainless steel to airplane construction, Mr. Sutton compares the structural possibilities of that metal with the more familiar light alloys of aluminum

By W. L. Sutton
Chief Engineer Fleetwings Inc



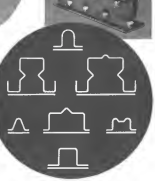
Typical shot welded rib construction

An example of composite corrugated and flat sheet construction—the wing flap for the Luscombe Phantom



Above: Another type of shotwelded wing beam with built-up tubular flanges, corrugated webs. The simplicity of the welded end fittings is apparent

Left: A built up stainless steel wing beam with relatively heavy flanges and light webs. Note method of joining webs by means of drawn cup-like depressions shot welded together



Some typical closed sections used as stringers or stiffeners with stainless steel stressed skin

THE PROBLEM of designing aircraft in stainless steel is much more complex than a mere changing over, section for section, from other more commonly used materials A totally new design concept is required Much depends upon a thorough understanding of the capabilities of the material and upon the exercise of considerable ingenuity on the part of the designer, for the weight-strength ratios of modern aluminum alloys set high standards at which to shoot.

Stainless steel, a comparatively new metal, has been used for structural purposes in the aircraft industry only since 1928 In spite of the established position of the light alloys of aluminum in that field, the newer material is already making itself felt as a serious competitor Persistent research has demonstrated that structures may be built in stainless steel with weight-strength ratios comparing favorably with those of aluminum and the future of this material in aircraft seems assured.

One of the principal advantages of stainless steel over aluminum alloys in design is, that for the supporting members in stressed skin construction (hull or wing stringers, girder web stiffeners, etc), closed sections such as the familiar Omega (see sketch) may be used without fear of corrosion or need of periodic inspection Closed sections with no outstanding legs or flanges to fail by twisting or buckling, will take higher compression stresses and are also inherently more resistant to accidental local damage due to handling With the closed section, also, more of the load is transferred to the skin to which it is attached, thereby increasing materially the overall efficiency of the stringer-skin combination Due to the relatively thin gages used however, it is necessary either to limit the flat pitch of these stringers (the distance across any unsupported flat area divided by the thickness of the sheet) to values between 15 to 30, or, to roll beads into the flats to increase local stiffness. By applying proper design principles it is possible to reach compressive values for closed stainless steel stringers (for sections in the 'short column'' category) of slightly more than 140 000 lb per sq in

For properly designed open channel sections in stainless steel, compressive stresses of approximately 120 000 lb per sq in may be realized For 17ST aluminum alloy, the Army Design Handbook gives the maximum allowable compressive stress as 40,000 lb per sq in The relative allowable stresses, therefore for closed sections is 3 5 to 1 in favor of stainless steel and for open sections 3 0 to 1 The weight ratio (stainless steel—0 284 lb per cu in, aluminum alloy—0 101 lb. per cu in.) is 2 81, therefore the advantage obtained from the use of properly designed stainless steel sections is obvious Furthermore, as no heat treatment, anodizing or protective coating is necessary for stainless steel, the cost of fabrication and of maintenance is materially reduced

Shot welding advantages

Shot welding enables the stainless steel aircraft designer to take full advantage of the skin between, and adjacent to the flanges of a closed stiffener or stringer By placing the shot welds relatively close together the maximum amount of skin may be made to work with the stringer If rivets were used the pitch would naturally be determined by size and weight of the rivets Shot welds weigh nothing and as many attachment points as are wanted may be used Because of the small diameter of each weld, small outstanding flanges are permissible This saves weight and also results in a low figure for flat pitch which means in turn that the flange itself may be counted on to carry high unit compressive stresses A $\frac{3}{16}$ in flange is considered sufficient for welding for typical stringers although some members have been made with $\frac{1}{8}$ in flanges that were entirely satisfactory

It is apparent then, that if the proper design precautions are taken shot welded stainless steel stringers compare favorably in efficiency to aluminum alloy open sections For any given design and allowing for protective coatings, the aluminum alloy skin would be approximately twice the thickness of the stainless steel skin and, therefore, would possess greater local stiffness The present tendency, however, seems to be toward carrying the majority of the stress in stringers, utilizing the skin largely as a restraining influence on the stringers In a series of tests on skin and stringer combinations recently completed it was found that for a given weight, the specimens with the thinnest skin and thickest stringers carried the greatest compression loads Stainless steels lend themselves particularly well to this type of treatment, and, in the hands of competent designers, may be made to yield excellent structural efficiencies

Stiffness

In certain cases such as leading edge covering split flaps, fuel tanks, etc , it is desirable to have a large amount of local stiffness in the skin itself At first glance, aluminum alloy appears to have a definite advantage over stainless steel, for its thickness (for equal weight) is approximately $2\frac{1}{2}$ times that of stainless steel Assuming that stiffness varies as the square of the thickness, the aluminum alloy skin is approximately $6\frac{1}{4}$ times as stiff as a stainless steel skin of equivalent weight To illustrate what may be done by applying an appropriate design technique, however, a stainless steel leading edge was fabricated from a combination of 0 005 in thick corrugated sheet shot welded to a flat 0 005 in skin The corrugations were $\frac{3}{16}$ in

deep and ⅜ in. pitch The commonly used flat aluminum alloy sheet leading edge covering (with one coat of red oxide and two coats of Navy gray enamel on each side) of equal weight would have a thickness of approximately 0.028 in. On test, the built up stainless steel leading edge had more than five times the stiffness of the aluminum alloy section it replaced.

The cost of this type of assembly is astonishingly low. The corrugations are shot welded to the skin while the whole unit is flat. A semi automatic roller welding process is used which requires only one operator to make welds at the rate of 960 per minute. After welding, the composite sheet is wrapped around the leading edge of the ribs and shot welded into place. As fewer leading edge ribs are needed in this type assembly than would be required with the .028 in. aluminum covering, the overall cost for fabrication compares very favorably with conventional aluminum alloy practice.

This type of construction also finds good use in fuel and oil tanks. Here it is often necessary to use large unsupported panels which, if made of thin flat sheet, are prone to "pant" with very large amplitudes and fail in fatigue when tested on a vibration machine. It is possible to prevent such flat plate instability either by bumping the unsupported panel or by reinforcing it. Certain fuel tanks, however, such as wing or fuselage side tanks, are necessarily of such shape that it is impossible to bump them without destroying their required contours. By using the welded corrugated-flat skin combination, stainless steel tanks are made that weigh less than a similar tank of aluminum. Besides weight saving, another advantage of the stainless steel tank is that it may be repaired in place by soft soldering. As these tanks are made from annealed pickled sheet, it is not necessary to use any etching acid before soldering.

Available sizes and shapes

Before going into detailed structural considerations a note on the form in which these materials come from the mills is in order. Commercial stainless steels (18-8) are now available in a wide range of sizes and shapes. Sheets 24 in. wide in gages from 0.005 in. up to 0.40 in. may be had with ultimate tensile strengths up to 185,000 lb. per sq.in., and in gages from 0.050 up to 0.094 in. in the same width with ultimate tensile strengths of 150,000 lb. per sq.in. It may be had in round or streamlined seamless tubing of strengths of approximately 175,000 lb. per sq.in. Round or square seamless drawn tubing may be had as small as 1/16 in. outside diameter with 0.005 in. wall. Bar stock comes in almost any size in tensile strengths varying from 80,000 lb. per sq.in. up to 125,000 lb. per sq.in.

In order to judge between stainless steel and aluminum alloy as to which is the more efficient in tension, it is first necessary to establish the weight ratio between the two materials. Any protective coating used on aluminum alloy must be charged against it, as no paint or finish is required on stainless steel. Assume that the average thickness of the material used on the conventional all-metal airplane is 0.040 in. thick and requires one coat of red oxide primer and two coats of either Navy gray enamel or olive drab enamel on both sides for protection. As the weight of the coating is 0.0004 lb. per sq.in. and the weight of the unpainted aluminum alloy is 0.040 × 0.101 or 0.004 lb. per sq.in., the painted aluminum alloy sheet weighs 10 per cent more than the unpainted aluminum alloy sheet. Stainless steel has a unit weight of 0.284 lb. per cu.in., while the painted aluminum alloy sheet has a unit weight of 0.101 + 10 per cent, or 0.111 lb. per cu.in., which gives a weight ratio between stainless steel and aluminum alloy of 2.58.

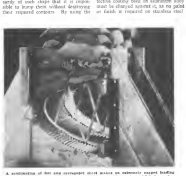
Comparative physical properties

As 24ST aluminum alloy is now commonly used in aircraft, it will be used for comparison with stainless steel. The physical properties of the two materials given in the Army Handbook are as follows:

	24ST Aluminum Alloy	18-8 Stainless Steel Hard Temper
Ultimate Tensile Strength (lb. per sq.in.)	62,000	185,000
Yield Point (lb. per sq.in.)	40,000	150,000

For a stainless steel tension member a weight saving, based on ultimate tensile strength, is $\frac{185,000}{62,000 \times 2.58}$ or about 15 per cent, as compared with the equivalent aluminum alloy. Practical considerations dictate the use of stainless steel for both internal and external tie rods because of the greater efficiency in end terminals and the smaller cross-section required to take a given load. For the comparatively few members in an airplane designed by simple tension, stainless steel shows a very definite advantage over aluminum alloy.

Shotwelded stainless steel has one advantage not to be found in any other type of aircraft fabrication. It is very easy to secure a tension joint with 100 per cent efficiency. The efficiency of a riveted joint depends on the net area and usually runs around 75 per cent. Although it is possible to design a torch welded chrome molybdenum joint so that it will not fail in tension at the junction, the use of heat adjacent to the weld weakens the surrounding metal so that failure occurs at about 80 per cent of the tensile strength of the material. A shot welded stainless steel joint, on the other hand, can be designed so that the failure takes place in virgin metal at the full ultimate strength of the material.



A combination of flat and corrugated sheet makes an extremely rugged leading edge covering. Using only .005 in. sheet throughout, this member exhibited over five times the stiffness of the conventional aluminum alloy construction of equal weight

Mr. Sutton's discussion of the properties and uses of stainless steels in aircraft will be concluded in a second article to appear in AVIATION *for July*

Editorials

AVIATION

EDWARD P. WARNER
Editor

American Bluff, British Bluffer

FOR SOME TIME NOW our esteemed contemporary C. G. G., of *The Aeroplane*, has been telling his fellow members of the British aircraft industry, and some of them have been relaying the news to us, that at high noon on May-day he would rend the American air transport industry limb from limb. Naturally we were curious. We even allowed ourselves to wonder if by any possibility he had discovered something about us that we hadn't suspected ourselves and our best friends wouldn't tell us. We might have saved ourselves fretfulness on the subject, however, for when the important hour arrived the great blast exploded with all the enthusiasm of a comic-opera cannon going pop instead of BANG.

Of course Mr. Grey has an obligation to dish up an occasional piece in defense of home industry, but both his readers and his advertisers deserve better than they got. A bad case needs an extra-good lawyer. This one needed no less than a Gladstone.

Two pages of small type contain Mr. Grey's effort to justify his having captioned the pages "The Great American Airway Bluff." By the most astonishing misapplication of official figures we have ever witnessed he succeeds in arguing himself, and hopes to argue his readers, into the notion that the typical American airplane is just a trifle faster and not much less ancient than the one-hoss shay, and that "certain visitors to the United States" have made themselves guileless accessories to American propaganda. It would perhaps be unkind to suggest that the difference between the "certain British visitors" referred to and the editor of *The Aeroplane* is the difference between the man who has crossed the ocean to see for himself and the one separated from the facts by ten years and 3,000 miles.

► Mr. Grey's method was delightfully simple, not to say naive. He merely took the lists of all equipment *owned* by the several airlines as published recently by the Department of Commerce, and evaluated overall performance by striking averages for speed, payload and horsepower for the lot! Where this led him can best be shown by citing just one example. He calculated the performance of United Air Lines on the basis of the *average* machine, an airplane that travels at 127 m.p.h. on 759 hp. with a payload of 1,799 lb. That may be true when all the Fords, Boeing 80s, 40s etc. that still appear on the lists but are actually dismantled and in dead storage in hangars from Newark to Oakland are counted. As everyone knows, however, *all* UAL schedules for at least eighteen months have been flown exclusively with Boeing 247s and 247Ds, ships that cruise at 40 m.p.h. or better above the typical figures of current British air-line equipment. What our good friend in London lacked was someone to sit at his elbow to pick out for him the ships on his lists that are actually in service and to eliminate those long since retired, still in airline ownership but merely awaiting disposition through sale or by way the junk yard. To some countries transport equipment may be kept flying as long as it will hold together, but the American practice has been to give the patrons the benefit of progress and push planes into the back of the hangar as soon as newer designs of higher efficiency are available to replace them.

► As a poor substitute for a personal inspection of our airlines by Mr. Grey, we offer a few simple statistics. We have in active transport service on our domestic airlines five types of airplane that carry the bulk of our traffic,—the Douglas DC-2, the Boeing 247, the Lockheed Electra, the Vultee, and the Curtiss-Wright Condor. The rated top speeds of all but the Condor (190 m.p.h.) are in excess of 200 m.p.h. There are not, as our British friend would suggest, a "few" of these machines in service. Of the 127,000 airplane miles scheduled daily as of Jan. 1, 1935, slightly over 108,000, or about 85 per cent, were flown with these five machines. Changes since the first of the year bring the current ratio much higher, probably well over 90 per cent. The mileage flown daily on American airlines with airplanes cruising at over 190 m.p.h. at their normal operating altitude exceeds the total of mileage flown at any speed whatever on the lines of the whole British Empire and

of any Continental European country, all combined. The miscellaneous collection of "curiosities" mentioned by Mr. Grey, practically all of them engaged in the carrying of small quantities of mail under new contracts, account for less than 2½ per cent of the current total of operation.

Now admittedly, neither top speeds, nor yet the cruising speeds of individual aircraft can be taken as the measure of performance over an airway. As Messrs Allen and Oswald have so ably demonstrated in this, and in other issues of AVIATION, the really important factor is the so-called block-to-block speed, which takes into account the time spent in taxiing, taking-off and landing, and in climbing to and descending from the optimum cruising altitude. We are very much afraid that Mr. Grey fell into the further error of comparing our block-to-block, or scheduled speeds with the manufacturers' rated speeds for British planes. What our ships can do may best be illustrated by a few examples of actual schedules maintained over relatively long distances. To eliminate the effects of the terrible tailwind with which Mr. Grey seems to think all our planes are regularly equipped, the figures given are the averages for the schedule in both directions between the terminals named. The airline distance between Los Angeles and New York is 2,612 miles. TWA, with Douglases, flies it eastbound in fourteen hours 55 minutes, westbound in seventeen hours ten minutes. East and West, therefore, they cover 5,224 miles in 32 hours five minutes, making an average terminal-to-terminal speed, including intermediate stops, of a little over 162 m p.h. And this in ships that C.G.G. credits with a top speed of only 167 m.p.h.! One doesn't have to be much of an airline technician to know that to make such an average from coast to coast the actual speed in flight must be somewhere in the neighborhood of 200 m p h or better. United, using Boeing 247Ds, flies the 724 mile trip between New York and Chicago (including regular stops at Cleveland and Toledo) eastbound in four hours twenty minutes, westbound in five hours five minutes, averaging 153 m p h for the round trip. American, with Vultees, on the 943 mile stretch between Chicago and Ft. Worth (Texas) averages 153 m p.h. over the two-way trip, with five intermediate stops each way.

▶ To stack up against the American figures, consider the performance of Imperial Airways on some of the crack European schedules. One of the best runs is from London to Budapest with four intermediate stops. Using the same method of calculation as for the American speeds, the average for the run is 112 m p h. London to Paris, non-stop, is flown at 109 m p h. The trip from London to Zurich via Paris and Basle takes six hours 30 minutes, averages 90 m p.h. By contrast, Swissair flies the same route in three hours 50 minutes, but then, Swissair uses American-built equipment!

Turning now to the problem of the relative efficiency of individual airplanes, where Mr. Grey placidly states that "British . . . machines have simply got the Americans skinned." There is a useful device, well known among engineers, by which the overall efficiency of airplanes may be expressed by a single coefficient calculated from speed, power and wing area. From the latest edition of Mr. Grey's own reference book—Jane's "All the World's Aircraft"—we have computed efficiency factors for our five most popular transport airplanes and also for the seven or eight British planes which he held up as outstanding examples of efficiency in his article. For the American group, with one exception (where the figure was 179) the values lay between 184 and 189. For the British it wasn't so good. It ranged, sad to say, from 139 to 160. Even the D. H. Comet, a special purpose racer which by no stretch of the imagination had any earthly reason to be dragged into a discussion of commercial transports, shows a value of but 183, exceeded by four out of five of our transport types. Five years ago the coefficient averaged about 130, for British and American machines alike. Obviously, then, we have advanced almost twice as fast in producing efficient aircraft as have our colleagues overseas. This, curiously enough, in spite of the fact that over here (as Mr. Grey points out) we "have money to burn" and are not supposed to give the proverbial whoop in Hades for what it costs to run things. One would have thought that on British routes where fuel costs are so exceptionally high, maximum efficiency and the consequent maximum economy would be No 1 Problem for airplane designers.

▶ By and large, Mr. Grey's attitude appears to be that of a few of his countrymen who have come over recently. They absorb what they can of the new technique, then depart, shaking their heads sadly, saying that after all, we have nothing to offer that would be suitable for the very special requirements of England's Empire routes. It does seem a bit strange that the Dutch, whose colonial services parallel very closely those of the British, have found so much virtue in American-built equipment. But then the Dutch are a peculiar race. They are notoriously hard headed in business matters and are prone to buy things on grounds of proven performance rather than of sentiment.

Mr Grey's outburst has furnished us not only considerable amusement, but also considerable satisfaction. For years we have been editorializing on the superiority of American aeronautical equipment in world markets. When anyone of Mr Grey's caliber gets jittery enough about the situation to build up a wobbly case with such straws as he can clutch, we begin to feel that efforts to promote the sale of American equipment abroad have not been entirely in vain.

Flying Equipment

Automatic Mixture

New Pratt & Whitney carburetor control gets long workout on first Pan-American Pacific flight

AS THOSE who have been following AVIATION's cruising control series are well aware, transport flying is becoming more and more an engineering job. The pilot must not only be entirely familiar with his radio and flight instruments but also must know how to make use of his cruising control charts if he wishes to get the highest efficiency from his plane and engine. Efficiency and economy are synonymous.

Until recently the control of fuel-air ratios has been left in the hands of the pilot. A mixture control handle is a standard part of practically every throttle assembly. That the method is far from satisfactory is indicated by the fact that different pilots may fly the same airplane over the same route with variations in fuel used per hour of the order of 10 to 25 per cent.

Not only has manual mixture control been proven uneconomical but it may also be dangerous. Excessive thinning out of mixtures easily results in damage to the engine. Then, too, the advent of constant r p m controllable propellers has eliminated one of the best known and most practical methods of making mixture adjustments.

Closely related to mixture control is the problem of limiting the power output of a supercharged engine below its critical altitude. Limitation can be accomplished by close attention to manifold pressure gages, but the pilot has plenty to do otherwise and it would be very desirable to provide some sort of automatic device for this purpose.

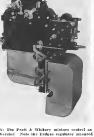
With these thoughts in mind, the late Thorp Hiscock (United Airlines) proposed to combine both mixture control and power limitation by throttling the air entering the carburetor to maintain a density at the entrance to the venturis equivalent to some predetermined altitude. Thus the carburetor would virtually be held at altitude and would deliver, even though the airplane might be at sea level, a mixture of the same fuel-air ratio that it would normally deliver at the selected altitude. Having thus assured the maintenance of constant density below that altitude, it was further proposed to position (calibrate) the mixture control so that with the conventional carburetor a uniformity of fuel consumption would be maintained below that altitude.

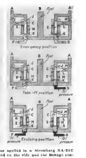
As the development work proceeded, it became apparent that it was impractical mechanically to position the needle valve type of mixture control with sufficient accuracy to give the required result. A new type of multiple jet system was therefore evolved with poppet valves cutting various metering orifices in or out as dictated by operating requirements.

The current production model, as shown in one of the accompanying illustrations, consists of an Eclipse Model 3105-B regulator mounted on the rear of a Stromberg Model NA-Y9C carburetor. The air valve assembly is mounted on an elbow scoop below. Future models will probably have the air valve built directly into the carburetor.

The jet and passage arrangements inside the carburetor are shown in the drawing. Various rates of fuel flow may be obtained by cutting off one or more jets through the action of the poppet valves to take care of cruising, take-off, and emergency conditions. Assume, for example, that in the cruising position the regulator is maintaining a pressure equivalent to an altitude of say 11,000 ft. The density in the carburetor is, therefore, greatly reduced (as compared to sea level) and Jets I and M are selected to give the desired consumption at this altitude. As the air regulator will maintain a constant pressure in the carburetor (between sea level and 11,000 ft.), these two jets will give uniform metering at any altitude below that for which the device is set.

In the take-off (or maximum allowable power) position the regulator is set to maintain a pressure equivalent to





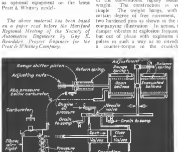
Left: The Pratt & Whitney mixture control as applied to a Stromberg NA-Y9C carburetor. Note the Eclipse regulator mounted on the side and the linkage connecting it to the pressure control valve on the intake elbow. Right: Jet operating diagram for the three control positions. A, Fuel from float chamber; B, To main discharge nozzle; C, Valve; D, F, Connections to selector valve; E, Fuel and oil seal bellows; G, Take off jet; H, Valve return spring; I, Left hand cruising jet; J, Valve seal; K, Operating piston; L, Emergency Jet; M, Right hand cruising jet.

a somewhat lower altitude, say 7,000 ft This necessitates additional jet capacity and, as shown, jet G is brought into action by the operation of the poppet valve. In the emergency position the air regulator is held wide open and atmospheric air has free entrance to the venturis Under this condition further jet capacity is required and jet L is brought into action by its appropriate poppet valve By selecting proper jet sizes it is possible to obtain any desired fuel consumption for the three possible operating conditions The jet selector valve is manually controlled by the pilot It admits or releases engine oil pressure from the carburetor poppet valves to put the proper jets into action

In the present arrangement no provision has been made for automatically regulating intake air temperatures. Although it would be perfectly feasible to put on an automatic control to bleed warm air into the intake system as required, on the advice of several operating companies the regulation of intake air temperature has been left in the hands of the pilot

The Pratt & Whitney mixture control has had many hours in the air on experimental flights, and has also seen considerable service on airline installations. Most notable work-out, however, was on the record Pacific crossings of Pan-American's S-42 The four Hornet engines were automatically regulated during the entire flight As a result of these successful service trials, the carburetor control is now available as optional equipment on the latest Pratt & Whitney models

The above material has been based on a paper read before the Hartford Regional Meeting of the Society of Automotive Engineers by Guy E. Beardsley Project Engineer for the Pratt & Whitney Company.



Operating diagram for air pressure control valve of the Pratt & Whitney automatic mixture control

New Series Wright Cyclone

Department of Commerce approves high rating for new F-50 Cyclones

JUST ANNOUNCED is a new series of Wright Cyclone engines carrying D of C power ratings higher than any heretofore issued for single-row radial air-cooled engines The F-50's carry forward the unbroken chain of design improvement which dates from the introduction of the Wright P-1 450 hp engine in 1924 The detailed ratings of the series so far produced appear below

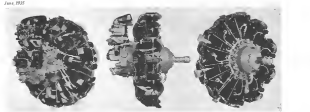
Although the fundamental relationship between the design and construction of the F 50's and the preceding F's are apparent on first examination, five major refinements have been incorporated in the new design to yield higher outputs (both at sea level and at altitudes), increased economy, reduced maintenance, and smoothness of operation of a very high order Following usual Wright practice, practically all parts of the F-50 Cyclones (with the exception of the supercharger drive gears) are interchangeable—an important maintenance consideration.

Outstanding design change is the addition to the crankshaft assembly of a dynamic damper Essentially, it consists of a pendulous counterweight applied to the rear crank throw in place of the conventional rigidly mounted weight. The construction is very simple The weight hangs, with a certain degree of free movement, on two hardened pins as shown in the accompanying illustration In action, the damper vibrates at explosion frequency, but out of phase with explosion impulses in such a way as to introduce a counter-torque in the crankshaft which balances out torque fluctuations, the primary cause of torsional crankshaft vibration It can be shown mathematically that the frequency of the pendulum bears a constant ratio to crankshaft speed. For the F-50 Cyclone, the frequency is made $4\frac{1}{2}$ times crankshaft r p m , which coincides with explosion frequency.

Stops are provided to limit the motion of the counterweight during sudden crankshaft acceleration In normal steady operation, the counterweight never strikes the stops, for they are so arranged to permit a motion considerably in excess of that required to completely dampen vibration at any speed The damper has been subjected to more than 1 000 hours of testing, including repeated backfiring and violent acrobatics without any evidence of malfunctioning Because of the smoothness of operation attained, it is possible to run the engines without any speed restrictions through the entire operating speed range

From a maintenance standpoint, second only in importance to the addition of the dynamic damper is the automatic valve gear lubricating system, an integral part of all the new engines Manual control of the lubricating oil entering the valve gear system is provided by a remote operated valve mounted on the main oil pump To maintain lubrication in the rocker boxes the valve handle is operated periodically while in flight The installation is simple and direct The oil is led from the control valve through an external oil line to the rocker box of No 1 cylinder All rocker arm bolts around the engine are interconnected by short lengths of flexible tubing to make a continuous and complete circuit In each rocker bearing bolt a metering hole has been drilled through which oil is forced into the rocker arm bearing and into the box to lubricate the valve stem the rocker roller and the push rod ends Excess oil is absorbed in a felt pad in the rocker box cover as a further aid to the general lubrication of the box

No lubricating oil from the valve system is returned to the engine oil supply When the control valve is operated on schedule, only sufficient oil passes into the system to replace that which has been consumed since the last application Since oil is supplied to the boxes only when the control valve is open there is no danger of a loss in engine lubricating oil due to accidental breakage of any of the interconnecting lines In case a failure should occur, there will always be enough oil retained in the felt pads to permit safe operation of the engine for a long period of time



The Series F-50 Wright Cyclones enjoy exceptionally high ratings for single row air cooled engines The valve gear lubricating tubes, new cowl baffles, rearranged rear end, are shown

Engine No	Prop. Drive Ratio	Rated R P M	Sea Level Hp Take-Off	Sea Level Hp Normal	Altitude Hp Feet	Altitude Hp Rated	Comp Ratio	Blower Ratio	Dry Weight
SR1820-F52	1 1	2 100	820	740	5 800	775	6 40	7 00	945
SGR1820-F52	16 11	2 100	804	725	5 800	760	6 40	7 00	1,038
SR1820-F53	1 1	2 100	750	685	11 000	750	6 40	8 31	945
SGR1820-F53	16 11	2 100	735	672	11 000	735	6 40	8 31	1 036
SR1820-F54	1 1	2 100	655	605	16 200	700	6 40	10 00	945
SGR1820-F56	16 11	2,100	642	593	16 200	685	6 40	10 00	1 036

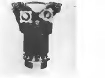
Cylinder cooling has been considerably improved by better foundry practice, which permits the casting of thinner, deeper fins on the aluminum alloy heads Spark plug location has been shifted, not only to permit cooling by direct air blast over the cylinder heads, but also to shorten flame travel and provide improved heat flow away from exhaust valve seats Both exhaust and intake ports are at the rear of the cylinder head on the F 50 Cyclones Exhaust ports are now provided with four studs instead of two, a feature which permits stronger flanges and provides more rigid attachment reducing the possibility of leakage

Cylinder barrels follow the same design as used in the Series F They are machined from alloy steel forgings and are threaded for insertion into the cylinder head. They are internally hardened to lengthen barrel life and reduce piston wear to a minimum Inter cylinder baffling has been improved to insure a smooth flow of air over all portions of the cylinder heads and valves yielding an unusual degree of uniformity of cooling

The supercharger unit of the F-50 Cyclone is basically the same as that of the older models Principal improvements consist of reduction in clearances to prevent air leaks, and the redesign of the curvature of the diffuser vanes to provide more efficient passage of the air

Further structural modifications involve the rear section to provide greater ease of installation Larger attachment studs have been provided for the oil pump, and the oil inlet and outlet connections have been dropped slightly to improve accessibility and prevent interference An angle drive attachment for the vacuum pump has been provided on the right side of the rear section The tachometer drive has been moved somewhat, principally to provide clearance for the installation of electric types

The ratings for the six (three geared and three direct drive) F-50s are given in the accompanying table All ratings are based on 87 octane fuel Overall diameter of all models is $53\frac{3}{4}$ in The SR 1850-F-52 engines are covered by A T C No 148 the SR-1850 F 53 by A T C No 149



Improved foundry technique has permitted thinner, deeper cooling fins on F-50 cylinder heads arranged for efficient heat removal from valve seats and spark plugs Note the flexible tube connection between rocker boxes, part of the new pressure lubricating system

The counterweight on the rear crank face is suspended on two hardened pins with a limited degree of freedom in the plane of the crank arm As a free pendulum it acts to damp out undesirable crank shaft vibrations promote smooth running over entire range of operating speeds

The latest Fairchild 22 gains performance from NACA cowl rounded fuselage. Slotted ailerons yield good lateral control at stalling angles

New Fairchild Offerings

The 1935 Models 22 and 24 show improved performance, greater flying comfort

Less spectacular than the flight trials of the new amphibian (AVIATION, May, 1935) or the promise of a new low-wing cabin monoplane for early summer, comes announcement of revisions in Fairchild Aviation Corporation's standbys, the open cockpit Model 22 and the closed Model 24 Long favorites of the sportsman-pilot, the changes now introduced should make these ships even more attractive to the private owner seeking comfortable and economical personal transportation

Chief modification of the Model 22 is the application to it of certain lessons learned from last year's Model 24 The fuselage has been rounded out to accommodate the same NACA cowling around the engine The landing gear, wings, ailerons and tail surfaces are also similar to those used on the closed model The airfoil is of the M-22 section With slotted ailerons, the lateral control characteristics at the stall have been definitely improved

Fuselage is of the conventional steel tube type, fabric-covered Tail surfaces are steel-framed, and wings are of wood, fabric-covered. In characteristic Fairchild fashion, the metal parts are protected by anodizing, cadmium plating and baked-on enamel The entire fuselage framing is sandblasted before being coatd with aluminum oxide

The Model 22 is powered with a Warner Super Scarab engine of 145 hp. Dual controls, electric starter and battery, navigation lights and tail wheel are included as standard equipment

The general specifications include span 33 ft length overall 22 ft 3 in height overall 7 ft. 11 in , wing area 173 sq ft , weight empty 1,240 lb , useful load 860 lb (of which 377 lb is payload), gross weight 2,100 lb , wing loading 12 4 lb per sq ft , power loading 14.5 lb per hp , maximum speed 135 m p h , cruising 125 m p h , landing speed 48 m p h , service ceiling 16,-000 ft

After a careful analysis of the use to which the 70 Model 24 Fairchilds built during 1934 were put, the specifications were written for the 1935 model Special emphasis was laid upon producing something that would appeal particularly to the sportsman or to the executive who

(Continued on page 42)

The 1935 Fairchild 24 follows last year's lines but more attention has been paid to comfort, baggage capacity Left: Wide doors give easy access to the automobile-like interior Pleasing decorative effects are obtained by the substitution of fabrics for leather on walls and seats

THERE'S A CLEAR FIELD "UPSTAIRS" TOO !

and it's paved with a film of oil no thicker than a hair

Lift her off the ground and you've still got a "clear field" signal—right on your oil pressure gauge. There's the "flag"—or the "green light" that tells you whether the oil you're using has the stamina to *keep* her "upstairs."

Texaco Airplane Oils are carefully and especially refined for aviation service. They are remarkably pure, and always uniform in quality. Their unsurpassed dependability in maintaining pressure under all sorts of flying conditions is a safety factor you can't afford to neglect. They are economical to use because their resistance to sludging reduces the expense of overhauls.

Big Ships—
Leading Airlines—Famous Pilots

Proof of the superiority of Texaco Airplane Oils is being demonstrated daily in all fields of aviation. Convincing evidence of this is in the fact, that with countless brands to choose from, "TWA," "Bowen," "Pennsylvania Air Lines," "Northwest Air Lines," "Delta Air Lines," and many other leaders standardize on Texaco.

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TEXACO AIRPLANE OIL ★ TEXACO AVIATION GASOLINE ★ TEXACO ASPHALT PRODUCTS FOR RUNWAYS, HANGAR FLOORS, APRONS AND DUST LAYING ★ TEXACO MARFAK

THERE IS AN EXTRA MARGIN OF SAFETY, SPEED AND ECONOMY IN TEXACO AVIATION PRODUCTS

[illegible] pilot [illegible] practice was [illegible] for suggestions that would appeal to the private [illegible] The net result is an airplane of essentially the same structural and performance characteristics of the 1934 Model 24 (AVIATION, May, 1934) but one with greater refinement and comfort in interior accommodations and with an increased gross weight allowance to accommodate extra baggage and equipment The seating arrangement remains the same, two seats forward and one in the rear, but the seats have been completely redesignd and upholstered in cloth instead of leather Doors are wider, cabin more accessible Considerable improvement also has been made in soundproofing

Some aerodynamic gains are realized from rounding up the lines of the fuselage, cleaning up the landing gear A few minor structural changes have been made to increase the strength, but despite such modifications the empty weight has not been increased, and the allowable gross has increased to permit a total payload of 577 lb The general construction characteristics and the special Fairchild features are the same as those outlined for the Model 22 The weight empty (given below) includes all standard equipment—wooden propeller, landing lights, heater and ventilator, radio standard instruments, turn and bank and rate-of-climb indicators, generator and engine shielding The power plant is the Warner Super Scarab rated at 145 hp at 1,900 r p m

The general specifications are span 36 ft 8 in, length 23 ft. 9 in, height 7 ft. 3 in, wing area 186 sq ft, weight empty 1,457 lb, useful load 943 lb, gross weight 2,400 lb, maximum speed 133 m p h, cruising speed (1 900 r p m) 118 m p h, landing speed at sea level 43 m p h climb at sea level 800 ft min cruising range 490 miles, service ceiling 19,000 ft climb to 10,000 ft. from sea level, 20 minutes

The 1935 Stinson Reliant is fitted with 225 hp Lycoming engine, Cruises at 130 m.p.h.

Fahlin's Plymacoupe

The latest effort to get the automobile engine into the air

ABOUT A YEAR AGO (AVIATION, July, 1934) Messrs Fahlin & Swanson announced a small side-by-side monoplane for two, powered with the British Pobjoy engine Recently it has been announced (AVIATION May, p 197) that the Department of Commerce, in its new development program seeking a source of cheaper engines for aircraft, has been cooperating with the Fahlin Manufacturing Company to the extent of applying a modified Plymouth automobile engine to the Fahlin airplane The first test flight was made about the middle of April, and a preliminary set of specifications to indicate something of the potentialities of this combination has been received Details of the power plant conversion are still lacking except as are visible in the accompanying photograph No production program has yet been announced, pending the outcome of Department of Commerce tests

The specifications so far released for this machine are Span, 32 ft., length overall, 17 ft 8 in, wing area, 178 sq ft, weight, empty, 1,075 lb, useful load, 536 lb, gross weight, 1,611 lb, wing loading, 9 04 lb per sq ft, power loading, 21 0 lb per hp, top speed, 120 m p h cruising speed, 104 m p h, landing speed, 42 m p h, service ceiling, 16,000 ft., endurance (cruising speed) 5 hr.

Stinson—1935

Improvements announced for Stinson Reliants

TO THE casual observer this year's Reliant looks much the same as the 1934 model As with many another well-known airplane or automobile, however Stinson's planes move forward steadily year by year without startling changes in external appearance but with continuous refinement of detail which adds to performance and the comfort of passengers

Structurally, the ship remains as before, with the well-tried steel tube fuselage and characteristic Stinson wings with wooden spars and metal ribs Highly polished fabric covers both fuselage and wings External lines have been touched up here and there—the nose is longer, windshield is of the sloping transport type, fuselage a bit more rounded, wing-tips washed up Standard power plant is the 225 hp transport type Lycoming engine, housed in a full N A C A cowl

The inside arrangement reflects the very sound philosophy of making the airplane more and more like the familiar automobile. In the new Reliant this effect has been heightened by making the control columns protrude through the instrument panel, displacing the older Y-type column and making more space available for pilot and co pilot Both forward seats are adjustable, have folding backs for greater convenience climbing in and out The doors are wide Windows are of safety glass, roll down to improve vision for both pilot and passengers Instrument board is indirectly lighted, hung on rubber Rear seats of the same type as used in the Model A Trimotor now appear in the Reliant at no extra cost The large electrically-lighted baggage compartment immediately behind the cabin may

Close up of converted Plymouth engine in the Fahlin Plymacoupe Note how flywheel section has been replaced with gear housing (approx 2:1 reduction) and propeller shaft

be reached either from outside or from within

Wing flaps are standard equipment as are Eclipse electric starters and Hamilton-Standard propellers Other items include 13 plate storage battery, parking brakes, Scintilla magnetos, Kollsmann instruments

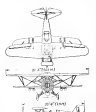
The standard model Reliant cruises at 130 m p h. A special model (SR-6B) fitted with 260 hp Lycoming motor, Lycoming Smith controllable propeller, extra gasoline tankage, sells for a little higher price has a cruising speed of 133 m p h

Hawks for Export

High performance fighter now offered abroad

Few airplanes can claim such brilliant ancestry as the Curtiss Type III Hawk latest and fastest of its line, which is now offered for the export market A Navy version (BF 2C-1) is used aboard our new carrier, the Ranger

A Navy BF 2C-1 from the Carrier Ranger.



The export model is provided with fittings for racks to carry 5-10 kg, 3-20 kg, or 2-50 kg bombs

Fitted with retractable landing gear and powered with the new Series F-50 Cyclone with dynamic crankshaft damper (see page 36) the new Hawk is designed primarily for high altitude fighting and bombing, climbs to 10,000 ft in less than five minutes, speed, 244 m p h. at that altitude

Welded steel tubing is the structural material for the fuselage, which is constructed in three separate units, riveted together in final assembly. Engine mounting is the usual type with rubber mounting blocks introduced at the points of attachment of engine to ring.

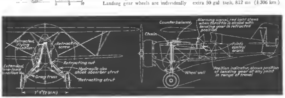
Hollow box beams with flanges of spruce and plywood webs are used in the construction of the wings which are tapered in plan form The upper wing is in a single unit, lower panels bolt to the fuselage Welded steel tube beams and aluminum alloy ribs constitute the tail surface construction Fabric covering is used on all surfaces and on most of the fuselage.

Landing gear wheels are individually controlled and retract into wells on the fuselage sides Retraction is accomplished by drawing the oleo shock absorbers upward with a vertical screw mechanism as indicated in the accompanying drawing

Normal fuel load is 110 gal, gives a cruising range of 561 miles A 50 gal auxiliary tank increases it to 812 miles

Specifications follow

Span, 31 5 ft. (9 60 m), length, overall, 23.5 ft (7 11 m.); height, 9 95 ft (3 04 m.), wing area, 262 sq ft (24,35 sq m), gross weight, 4,230 lb (1,919 kg.), weight empty, 3,163 lb (1,435 kg), useful load, 1,067 lb (484 kg), wing loading, 16 1 lb/sq ft. (78 8 kg (1 sq m), power loading, 5 45 lb/hp (2 46 kg/hp), maximum speed at 10,300 ft (3,140 m), 244 m p h (392 7 km/hr), cruising speed at 10,300 ft (3,140 m), 204 m p h (328 3 km/hr), maximum speed at sea level, 204 m p h (328.3 km/hr), service ceiling, 25,800 ft. (7,860 m), absolute ceiling, 26,650 ft (8,120 m), range (normal fuel load) at cruising speed at 10,300 ft (3,140 m), 512 mi (903 km), range with extra 50 gal tank, 812 mi (1 306 km)



Details of the retractable landing gear of the export Curtiss-Wright Hawk.

Operator's Corner

An exchange of ideas on the problems of the commercial aviation industry

Question 6 How many hours do you require a student to have before cross-country trips? What is the method of payment? Does he receive a rebate on the gas he buys away from the field? (Submitted by O E Richardson Ann Arbor Air Service)

Close supervision needed

WE require a student to have about 25 hours before he is permitted to make a cross-country trip His first cross country trips are very closely supervised and are quite simple When the student buys gas away from the home port, the gas charge is absorbed by us

We allow our students a deferred payment plan, as it is very rare that a student is found who can pay for an entire course in a lump sum—WINSTON W KRATZ, *vice-president St Louis Flying Service, Lambert Field, Robertson, Mo*

Ability the criterion

WE do not use flying hours as a determining factor in judging a student's ability to fly cross-country The privilege of going cross country depends on ability A number of trips are made with a check pilot before he is allowed to go alone He is rated according to the report of the check pilot, on his ability to find given points and on his ability to judge weather in his past work at the field The students asking for a plane at the field and asking us about the weather, are asked to judge the weather themselves and we check their judgment against their ability in handling the plane Hours are a good barometer to help the operator judge but the student's aptitude is the final criterion

When a student qualifies to go cross-country he is reimbursed fully for all gas and oil purchased away from the field. The cost of hangar rent etc , is absorbed directly by him We have not as yet made any additional charge above solo price on cross-country. We do not get so very much of this business and the loss of the use of the plane at the airport while it is away does not seem to enter into it at this time As a matter of fact, we have one ship that is used mostly for that type of work and as yet it is not over-worked—E L MARKHAM, *manager Meriden Aircraft Corporation, South Meriden, Conn*

Follow D. of C. recommendations

IN determining the qualifications of a student to fly across country we adhere strictly to the recommendations of the Bureau of Air Commerce We suggest that he take an instructor with him on the first few flights away from the home field

Charges are made on a flat hourly basis and billed either before departure or on a monthly statement, depending on the arrangement under which time is taken We try to discourage over night flights but, if they are made, storage and pilot expenses are borne by the student Gasoline and oil purchase prices are refunded if the student has paid for his time in advance.—HOWARD T AILOR, *president, Waco Sales of New York Inc, Roosevelt Field L I N Y*

A license first

IN our approved school the student will have received 40 hours before obtaining his private license. After receiving this license he is eligible for solo cross country trips Although amateur pilots are legally authorized to make cross country flights we do not look favorably on allowing any but private pilots to make them On our periodic group cross-country trips, however, students with less than 40 hours are permitted to accompany instructors and licensed pilots as copilots All students with more than five hours solo time to their credit are encouraged to make these trips as copilots The copilot is allowed to share time on the controls with the pilot The pilot, who is always in charge, is held responsible for the airplane. Naturally, the copilot shares his portion of the expenses of the trip

We have been making group cross-country trips on an average of once a month and they have been very popular Five or six planes are sent out over a course of about 150 miles Approximately five stops are made en route. At each stop students change airplanes and positions in the various airplanes to give them experience in different types As a rule, lunch is obtained during one of the stops An instructor is in charge of each flight In addition to group cross countries individual cross-countries are included in the course given at the school and students often request special cross-countries which are granted if the student is eligible.

If the flight is included in a course the student is taking in the school, the finances are taken care of in a previously arranged manner This is either by paying in advance for the entire course or by a monthly payment plan, or by paying a definite sum at the end of every so many hours of instruction. Each case involving a student not enrolled in a regular course is arranged individually In some cases the time is paid for in advance of the flight and at other times after

Any gas or oil purchased or necessary service charge paid by the student away from the field are rebated to the student upon presentation of the proper invoices—JOE PLOSSER *Grand Central Flying School, Glendale, Calif*

Standard hourly rate

WE require a student to have at least 30 hours of solo flying and several dual cross country trips, before checking him out for a solo cross-country trip The hourly rate is the same for such cross-country flying as for practice around the field, and we refund him the money spent for gas away from the field—R I NASH, *Aviation Associates Inc, East St Louis, Ill*

Group cross-country flights

A student must be able to make satisfactory simulated forced landings from any position and into strange fields before taking part in a practice our school has evolved Namely we arrange a group flight to a definite town for the week-end and it is advertised as a student cross-country training flight. On these flights the ships are kept together and one plane contains the instructor who has given definite instructions as to who lands first and last. At the stop over students give demonstrations to the public of their respective abilities and new prospective students are contacted On these flights some students own their own planes and accompany the flight at their expense and any student using school planes pays on an hourly basis for time flown. The instructor pays any bills for gas and oil on school planes A student must have at least ten hours of such supervised cross-country before making any trips by himself All such trips are made to nearby

Question 7

(Answers will be published in July)

DO YOU consider it necessary for an operator to carry crash insurance? What other forms of insurance do you consider essential? Have you found it possible to maintain fairly complete coverage and still keep operating costs at a reasonable figure? What proportion of your operating cost per mile goes for insurance? (Submitted by A Elliott Merrill president, Washington Aircraft & Transport Corporation Seattle, Wash)

Question 8

(Answers will be published in August)

WHAT is your method of paying pilots for dual instruction other services? Do you employ them on a straight salary basis or is there a salary plus hourly or mileage fee arrangement? Have you found it possible to retain your piloting staff the year around or is it necessary to reduce it during the winter? (Submitted by N V. Nationale Luchtvaart School Waalhaven Rotterdam, Netherlands

fields and gasoline is carried for the whole trip. If he is forced to buy gas away from home field and presents his bill properly receipted he receives credit on flight cost.—FRED W. WAHL, *president and general manager Mountain Airways Corporation, Rawlins, Wyo*

Time charts essential

WE confine a student to a limit of 10 miles from the field when operating upon a student rating. Otherwise we require a private license and a thorough check flight regardless of log book readings.

Payment is made in advance for an estimated time, and then checked against the time recorder chart with which all our ships are equipped. I will add to this point that in my opinion these recorders are absolutely essential to any operations. Gasoline and oil is rebated at the current price on the home port, the renter paying the differential.—ED. CAMPBELL, *chief pilot, United Air Services, Ltd., Burbank, Cal*

Over 30 hours necessary

WE require a student to have had sufficient dual cross-country so we can be reasonably certain that he will be able to find his way without getting lost before turning him loose on a solo cross-country and then we always let him go out on an easy course first, say of about 50 miles, and gradually step it up.

We find that some students are ready for cross country after around 30 hours while others will require many additional hours before we can feel sure of the sense of direction. We charge at rate of $6 per hour with the student paying all incidental extra expenses such as hangar storage, etc., should he stay over night. We however give him a rebate on any gas or oil he buys. Our present rate for Fairchild 22 is $6 solo.—L. G. MASON, *Aviation Supply Division of Montgomery School of Aeronautics, Montgomery, Ala.*

Fly by contract

I AM very much averse to students making solo cross-country trips without sufficient time to justify the risk. The amount of time depends on the ability and good judgment of the student. A student with ordinarily good judgment, and who has never shown any inclination to be "smart-alecky" should have at least 50 hours solo time before the solo cross-country, and if he is inclined in any way to be "smart" I would rather lose the business.

Before a solo cross-country I always manage to discuss the entire situation with the student, I inquire where he intends sitting down for gas or rest and ascertain whether he is familiar with the condition and type of field he intends sitting down on. We discuss hangaring if on an overnight trip, also the possibility of his being forced down in a strange field where there is no hangar or no night watch, in which instance I of course impress on him that a watchman must be furnished at his expense.

Although I would prefer charging him by the hour, I have found that it promotes a slight amount of unintentional dishonesty in reporting his time, and further than that causes him to cruise faster than should good judgment prevail. I therefore charge him a mileage rate between points, basing that rate on my prevailing charter rate for that particular ship. As a general rule the student pays the bill before starting the trip. We have all found this to be the safe rule in cross-country of any description. He pays for gas purchased and returns the receipted bills on which we of course reimburse him. If the trip is overnight he pays the hangar bill or watchman charge. Immediately on arrival at the destination he wires me collect stating his safe arrival and he has strict instructions not to do any flying except that contracted for.—KARL E. VOELTER, *All American Airport, Miami, Fla*

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QUESTION 3. Do you consider it advisable to continue your ground school instruction during flight training? Are ground courses economically justified? Have they been found to be successful as producers of students for flying courses? Should they be considered a prerequisite for flight training? Should this expense be absorbed by a charge separate from that for flight instruction or should the cost be included in that of the flight instruction, calling the ground course free? (Submitted by A. Elliott Merrill, president Washington Aircraft & Transport Corporation, Seattle, Wash.) Additional answers to this question were published in May.

Coaching Advantageous

IT seems advisable in our estimation to carry on ground instruction of some type during flight training. Ground courses have in a small way contributed as producers of students in flying courses but with the number of active students at a minimum it is hardly worth while to conduct at present a separate elaborate ground course whether worked in as part of the flying courses or not.

Coaching courses in the particular knowledge required for the various types of pilots' licenses, wherein the flying students are advised just what to study and then are coached verbally, sometimes using the "Questions System" of complete explanation, are effective and in a way inexpensive. They can be worked out with the students individually at such times as they are at the airport for flight instruction.

We do not feel that a ground course at any time should be a prerequisite for flight training.—J. GRANT MCDONALD, *chief pilot, Dycer Flying Service, Los Angeles, Calif*

Practical Training

WE FIND it very good practice to operate our ground school in direct connection with the flight training. From our standpoint ground schools are economically justified as the students are used to help maintain ships—i.e. wash down motors, wash ships, help service and in general assist around the hangar. The student gets a clearer picture of what it is all about and understands more readily what a ship will and will not do. They have not been necessarily of material benefit to induce new students to take up flying but are an inducement inasmuch as the student feels he is getting more value received for his money. All technical study is done in night school but is not a necessity before flight training. The cost of ground school is separate from the flight instruction but we find that practically all students that are interested at all will take the ground school work. In this manner some have enrolled for ground school and have taken up the flight at a later date when they were financially able.—FRED WAHL, *president Mountain Airways Corporation, Rawlins Municipal Airport, Rawlins, Wyo*

Demand Is Waning

WE have not found ground school instruction a paying proposition as students seem not generally interested enough to attend the classes regularly. We have completely discontinued any regular ground school class room work owing to lack of demand but should such demand exist in any locality we think it should be handled as a separate course distinct from flying and should be charged for a flat rate in advance for so many class room periods at as low a rate as the volume will permit, as undoubtedly the more ground students you can get to attend regularly the more chance you will have of getting some of them to take up flying and buy ships.—L. G. MASON, *Montgomery School of Aeronautics, Montgomery, Ala*

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Operating in The Netherlands

(Here we present replies to previous questions from one of our most active operator readers in The Netherlands. Unfortunately they arrived too late to be published with the domestic contributions. European practices should be of considerable interest to our readers in this country.)

Question 2. (Slow season operation; replies, AVIATION March 1935)

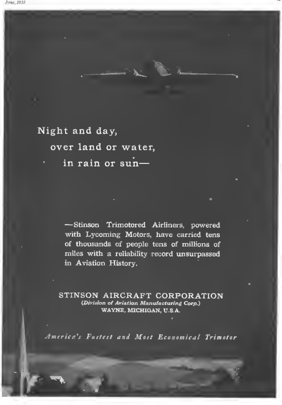
WINTER months show a lull in flying in Holland. We therefore introduced a winter reduction in hourly rate from October-April. At Christmas time we closed down our five schools for a fortnight on account of holidays. We have no other forms of work in winter for our organization. In order to meet the busy months in summer the commander of the military Air Force has put at our disposal one of the military instructors, who in winter months reenters the Air Force. This works out very economically.

Question 4. (Maintenance and Servicing, replies AVIATION April, 1935)

OUR machines are inspected after every 200 flying hours by an inspector of the Air Ministry. The Gipsy-Major motor is overhauled after 600 hours. Replacement of spares is done, following the directions of the Havilland factory.

Question 3. (Ground schools; replies AVIATION May, 1935)

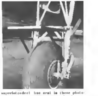
OUR schools have no ground-school instruction as exists in the U. S. Pupils now and then follow the work in the workshop and are allowed to do small jobs without extra payments. Theoretical courses have been introduced in the schools of navigation in Amsterdam and Rotterdam.—NATIONALE LUCHTVAART SCHOOL, *Rotterdam, The Netherlands*



The Maintenance Notebook

TWA Nacelle Stand

TO ASSIST in inspecting and servicing landing gear, controls and auxiliaries behind fire-walls inside nacelles on Douglas transports, TWA's maintenance department at Kansas City has devised a simple working platform which may be hooked to the landing gear to provide standing room at the proper height for a mechanic. Built of angle iron and tubing the platforms are light enough to be handled conveniently, stored compactly when not in use. The attachment hooks are padded with felt or leather to prevent damage to landing gear members.



Walter A. Hamilton, TWA's maintenance superintendent, has sent in these photographs of a nacelle servicing platform developed in his shop at Kansas City for use on Douglas transports

Protective Coverings

WHEN newly overhauled crankshaft and connecting rod assemblies cannot be installed in engines immediately at Pan American's 36th Street (Miami) shop, they are never permitted to lie exposed to the air, for the dry Florida winds are carriers of fine particles of dust and grit, extremely undesirable elements in close fitting bearings. Assemblies are first given a coating of light oil then completely encased in heavy dustproof canvas bags and hung up out of the way on hooks suspended from the roof beams. This method not only protects against dust and corrosion, but also clears work bench tops and minimizes the possibility of mechanical damage.

Dustproof bags protect connecting rod assemblies at Pan American's Miami Shop

Painter's Wagon

TO take care of odd spray painting jobs in various parts of the big hangar at TWA's Kansas City base a portable painter's wagon has been found very useful. Built of wood, mounted on large swivelling casters, it can be pushed easily where needed. The flat top makes a good working surface, and the cabinet part serves as convenient storage for paint cans, rags, masking paper, etc. Spray guns are hung on hooks. An air regulator unit with control valves and gages is mounted on one end.

This convenient painter's wagon finds a great deal of usage in small jobs all over the TWA Kansas City hangar

R.P.M. by Stroboscope

TO check the accuracy of r.p.m. of the master tachometer drive in U.A.L.'s Cheyenne instrument shop, a simple form of stroboscope has been applied. On the free end of the drive shaft of the variable speed motor a disk about

Stroboscope mounted on master tachometer drive in United Air Lines instrument shop at Cheyenne

12 in in diameter has been mounted On the face of the disk, five concentric circles have been drawn and each of the bands between the circles divided into alternate white and black segments Facing the disk, somewhat off center, is a small conical reflector in which is mounted a neon lamp

Connected to a 60 cycle alternating current supply, the neon lamp gives 120 flashes per second The markings on the disk can be so laid out that at certain predetermined speeds the alternate black and white portions of one of the five bands will appear to be standing still Thus for the five-band disk, five points on the speed curve may be obtained with great accuracy Moreover, beside the five basic speeds, intermediate points may be obtained by watching for harmonics ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc synchronous speed)

For routine tachometer testing, United checks the instruments out of the ships against a Weston electrical master tachometer, also connected to the master drive shaft. Periodically, however, the electrical tachometer is calibrated against the stroboscope

Engine Heaters

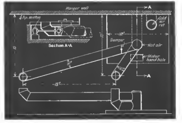
THIS time of year brings out a crop of engine warming devices developed during the winter by airlines operating in parts of the country where the expense of maintaining hangars at average year-round temperatures is not justified Thus in past years we have described in these columns Eastern Air Lines' method of connecting up engine nacelles to hangar heaters through canvas pipes, Northwest Air Lines' portable heater with its canvas engine hood and demountable gasoline stove, and the arrangement used by the Swedish Air Lines A B Aero Transport with portable steam heated units connected up to a central boiler plant Thanks to R H Hurd of Bozeman, Mont, we are able to illustrate another variation designed and built by National Parks Airways for their Boeing 247s and Fokker Super Universals

The single engine ships are usually heated in a canvas nose hangar erected inside the main building against one of the walls. Sliding curtains, shaped to button tightly around the entire nose of the fuselage, hang from a wood and fiberboard canopy 8 ft. wide and 10 ft long suspended parallel to, and about 9 ft above, the floor. Two 18 in pipes run up through the floor of the heater, as shown in the accompanying sketch One of them is hooked up to a hot-air furnace in the office basement, the other to the cold air return An automobile fan, driven by a $\frac{1}{4}$ hp. electric motor, and mounted in the duct as shown, provides forced circulation.

When warming up a twin-engine Boeing, the curtains are pushed back out of the way and extension pipes are mounted The outlets discharge hot air under canvas hoods drawn over each engine A damper is provided in one of the pipe extensions so that one outlet may be shut off to afford an alternate method of warming a single-engined ship

With this installation, an airplane engine can be heated from 0 to 75 deg in 45 minutes, or may be kept warm overnight, or for any desired period

A special wooden bench provides space for the Wadell boring fixture and all its auxiliaries in the engine overhaul shops of Aviation Industries Inc at Glendale



Layout for National Parks Airways' engine heating system The overhead wooden canopy and the canvas curtains are not shown

Boring Bench

A COMMON tool in engine overhaul shops is the Wadell Universal Boring fixture for reconditioning bearings on articulated connecting rods Few shops, however, have provided as convenient a set-up for the jig and its accessories as has Aviation Industries, Inc, at Grand Central Air Terminal, Glendale Here is a good example of how a relatively small expenditure may contribute greatly toward keeping odd corners ship shape at all times Readers of this department are aware by this time that few things appeal to us more as an index of shop efficiency than good housekeeping

The bench is built entirely of wood The hard-wood top is just large enough to accommodate the fixture and to provide the necessary working clearance all around On the sloping panel, wooden pins, sockets and shallow troughs accommodate all the auxiliary tools—chucks, bushings, positioning pins cutters, etc Small parts are kept in the drawer

News of the Month

★ ***Record Flights*** . . . **Tomlinson and Bartles fly TWA's DC-1 to eight new world's records and eleven American marks after Tomlinson and two companions lower the transcontinental record for transport planes . . . Aldrin sets world mark in new amphibian category . . . Miss Earhart returns non-stop from Mexico City.**

★ ***Transport*** . . . **Senate Post Office Committee finally reports out air mail bill with extremely unfavorable provisions . . . First serious accident of year kills five . . . transcontinental schedule lowered to fourteen hours, fifty-five minutes . . . Negotiations to reduce Pan American contracts fail . . . Bureau of Air Commerce to install twelve blind landing transmitters.**

★ ***Army and Navy*** . . . **Navy maneuvers in Pacific include intense use of fleet's aircraft . . . Navy appropriations bill passes Senate with liberal aeronautical provisions . . . Release of confidential testimony by Army officers on location of G H Q. air base near Canadian border brings Presidential censure.**

★ ***Foreign*** . . . **Air armaments race continues throughout Europe . . . Spanish use Douglas transports in new service to Paris . . . British open plane link from Paris to Mediterranean . . . Soviets launch a semi-rigid airship . . . Italians dedicate a new research center . . . The Maxim Gorky, world's largest landplane is wrecked over Moscow.**

★ ***Industrial*** . . . **Douglas developing new transport . . . Lambert Company sold . . . Executive committee for Detroit show announced.**

★ ***Financial*** . . . **Pan American reports excellent year . . . First quarter 1935 reports show Douglas earning substantial profits, Boeing and North American still registering moderate losses.**

A Record in Records

Tomlinson and Bartles take DC-1 on warpath to set eight world marks. Aldrin adds another. Tomlinson also lowers two transcontinental records.

FOR ALMOST AS LONG as there have been such things as recognized world's records of aeronautical achievement, American designers have cherished the conviction that American aircraft were capable of holding a larger share of them than has ever been the case

Just what was needed to start the present active campaign to put that conviction to the test would be hard to say Editorial comment has had some thing to do with it, for this magazine and others have been airing the subject for the last several years Posssibly it needed the fundamental stimulus of a growing export market and an expanding world-route consciousness, possibly some such dramatic contest as last year's MacRobertson Race, possibly such a well coordinated drive as Senator MacAdoo is conducting as President of the N.A.A to get at least our stock models put through their paces before the proper witnesses In any case the events of the past month have put us within five records of leading all other countries in the number of world marks held and promise undisputed leadership before the summer is past.

And just two flights have made the bulk of the difference Both were made in T W A s first Douglas transport, the DC 1 Both were carried out by D W Tomlinson, assistant to the president of the airline, and Joseph Bartles one of its pilots Both were over a 620 mile triangular course from Floyd Bennett Field to Washington, D C, to Norfolk, Va, back to Floyd Bennett

The first flight began at 6 58 a m, May 16 Carying a gross load of 24 845 lb the machine rose slowly after a 3,000 ft run, cleared the seaplane ramp at Jamaica Bay at 15 ft, climbed to 10,000 in easy spirals, signalled that it was ready to start, was checked by theodolite (as it was at all the turns), and headed off on its course Throughout the first hours the weather held fair and the plane was able to stay above 10,000 ft except at the southern end of the course where it was forced to descend to 8 000 to be below clouds at the observation stations After the third lap ceilings lowered rain squalls occurred, the plane's speed was cut substantially by having to cruise below its best operating altitude Finally conditions grew so difficult that the fifth lap was changed with the permission of the observers It consisted of a trip from Bennett to Washington and return, then a circuit about Bennett, Newark and North Beach Airports until the full 3.100 miles was completed The load included 1 600 gal of fuel and 2,200 lb of sand as official payload

The second flight, starting a few minutes after noon, two days later, was made under perfect conditions Although the payload was greater (4 400 lb) fuel sufficient for only two laps was carried with a resultant gross load of 22,500 The normal rated all up weight of a Douglas in transport service is 18 000 lb Throughout both flights the two 715 hp Cyclones functioned perfectly as did the Sperry Robot pilot which was in continuous use

New World's Records

Miles	Payload (lb)	Speed (m p h.)
620	2 200	191 97*
620	4 400	191 67*
1 240	1 100	190 91*
1 240	2 200	190 91*
1 240	4 400	190 01*
3 100	none	180 82*
3 100	1 100	160 03†
3 100	2 200	169 03†

*Old record broken †No previous record

In addition to the above, which of course constituted new American records American marks were broken for 620 miles without payload with a speed of 191 67 m p h , for 1,240 miles without payload, speed 190 91 m p h , and a new American mark of 191 67 was set for 1 240 miles with 1 100 lb of payload

Previously on April 30, Pilot Tomlinson, accompanied by Hal Snead, radio expert and Peter Redpath, navigator, had flown the same ship from Burbank field, Los Angeles, to Floyd Bennett in an eleven hours and six minutes non-stop dash a new transcontinental record for transport planes, a new non-stop record for any category A striking achievement eclipsed only by the whole-

sale record smashing a fortnight later

After noteworthy feat which in a different month would have been more outstanding was the establishment of a world's record in the new amphibian category of 159 8 m p h for the 62 mile course by Maj Edwin E Aldrin in Stanavos new Douglas Dolphin following its christening at the Newark Airport Date May 15 Christener, Amelia Earhart Name, Essowing

Subject to final homologation, the record score now stands France 45 United States 41, Italy 21 Germany 8 Poland 2 and Austria 1 Great Britain astonishingly, holds only a single world's record at this time

Faster Crossings

Log-notes on the month's transport developments

TWA has added a fourth daily transcontinental schedule each way to its service, has dropped the time for its best eastward crossing from Los Angeles to Newark to fourteen hours and 55 minutes

Northwest Airlines, with a new overnight Lockheed Electra schedule between Seattle and Chicago to operate, has added eighteen pilots ten mechanics and eight radio dispatchers to its staff, some $200 000 to its payroll

Harlee Branch, second assistant postmaster general has announced that hearings will be held June 20 at which evidence can be submitted by both sides in the Newark-Floyd Bennett rivalry for designation as the official New York air mail terminal

Buffalo and Cleveland airports both report increases in April above the record breaking passenger traffic figures established at those two terminals in March

An interesting development of recent months has been the stressing of scenic features by airline traffic departments in their advertising TWA offers its transcontinental passengers a view of the Grand Canyon, United offers Boulder Dam, American Airways stresses that old favorite, Niagara Falls

The Ford Trimotor which has stood in the lobby of New York's Pennsylvania Station since the spring of 1930 and probably ranks with the Spirit of St Louis as the country's most looked at airplane, has been dismantled and shipped to the Ford museum at Dearborn where it will be permanently exhibited

Negotiations between the Post Office Department and Pan American and Pan American Grace looking toward a reduction of payments for carrying South American mail have failed The United States pays the companies about $7,000 000 a year for its Latin American services on contracts running between $1 25 and $2 an airplane mile The situation has been placed before President Roosevelt, is not expected to affect Pan American efforts to secure $2 000,000 for its trans Pacific project

Awaiting delivery of equipment which has been on order for several months, the Bureau of Air Commerce is proceeding with the survey of twelve sites for the installation of blind landing transmitters The fields selected are located at Newark, Pittsburgh, Columbus Cleveland Indianapolis, Chicago, St Louis, Kansas City, Los Angeles, Oakland Seattle and Washington, D C.

NEW CHAMPION

of American record holders is D W Tomlinson who last month lowered the transcontinental record for transport planes to 11 hrs and 5 min, then proceeded to bring eight world's records into the American column

Tragedy in Missouri

First 1935 airline accident involving passenger fatality

SAVE for the uncertainty of the air mail contract situation, airline operators in the United States could well point to the first four months of this year as the most remarkable in their history The upward mark in passenger and express figures had continued unabated March usually one of the poorest months of all for passengers, had this year turned out the best in passenger mileage in transport history (24,134,000 against last year's 8 717 000) April, for which full figures are not yet available, seems to have been at least as good. Even more important and encouraging in the minds of most operators was the fact that no passenger had been killed during the period. With the worst of the year's weather definitely past, many were hoping that at least a half year could be gone through with perfect safety

Rude shock was news that a TWA Douglas had crashed near Macon, Mo on May 6 killing Pilot Harvey Bolton Co pilot Kenneth Greeson, three passengers including Senator Bronson Cutting of New Mexico, injuring seven others

The final report on the accident by the Bureau of Air Commerce is not yet available These things, however, seem definitely established The plane, east bound, had been warned not to attempt a landing at Kansas City due to a thick fog at that field, had sought an emergency field at Kirksville unsuccessfully Its radio transmitter had not functioned properly on the entire trip from Los Angeles, had quit west of Wichita Log entries indicated trouble with the receiver also. Some evidence exists that the engines had failed just before the landing, possibly due to failure of fuel supply when the emergency tanks were cut in The crash occurred against the side of a bank just short of a sizeable field of

level ground. The wheels had not been lowered

In spite of the prominence of Senator Cutting editorial comment was markedly temperate Wide was the mention of the good record through the winter Frequent the reminder that this was the first Douglas fatality in America, the first TWA passenger fatality since March, 1931 Domestic airlines had still an opportunity to complete the year's first six months with a record close to 30,000 000 passenger miles per passenger fatality

Airline Constrictor

Is the new McKellar Bill offered by the Senate Postal Committee

FOLLOWING two months of delay and very few hearings, the Post Office's Committee of the Senate produced its own idea of air mail legislation as an alternative to that recently passed by the House. The Senate version is eloquent of a fear lest the airlines get away with something, or grow too strong or too rapidly

It would allow the Interstate Commerce Commission to modify contract rates, either upward or downward, retroactive to March 1, but never to above 40 cents a mile and never in such a way as to take into account any losses sustained on passenger business The Senate bill explicitly designates the Pacific Coast route as non-primary, so allowing its continued operation by United, explicitly marks down the route from New York to Miami as primary, prohibiting its falling into the bands of any of the transcontinental operators. It gives the I C C authority not merely to ignore non-mail schedules in determining rates, but also to order their decrease or suspension at any time, gives the I C C the right to cancel contracts for cause, the Postmaster General to do the same on 60 days' notice without cause Most remarkable of all, it extends the present salary limitation to cover all compensation received from all sources, thus making it impossible for a banker or a manufacturer of automobiles or of chemicals to serve on the board of directors of an air line if his salary from his bank or manufacturing business or from all sources combined exceeds $17,500

Calendar

June 17-22—Annual Indiana Air Tour Take-off Indianapolis Municipal Airport.

June 29 July 14—Fourth Annual Meeting Soaring Society of America, Elmira, New York.

June 29 30—Tulsa Southwest Air Races Municipal Airport Tulsa, Okla.

July 20-28—National Air Show Detroit Municipal Airport. Detroit.

Aviation in Congress

BILLS FAVORABLY REPORTED OUT OF COMMITTEE

Number of Bill	Introduced By	Purpose
Exec 6	Pittman (Nev)	Report from the Senate Foreign Relations Committee recommending American ratification of the International Sanitary Convention for Aerial Navigation to control quarantine arrangements and other provisions for preventing the carriage of infections by aircraft
HR 3808	Smith (Va)	To create a seven man commission including five government officials and Amelia Earhart to select a site for a Washington airport and thereafter to create a permanent commission to develop and operate a field Includes an authorization for a $2,580,000 expenditure Favorably reported by the House Committee on the District of Columbia with incidental highly unfavorable comment by the committee on the Gravelly Point site.
S 2727	Sheppard (Tex)	To buy five acres of land for the purpose of enlarging Kelly Field San Antonio Favorably reported by the Senate Military Affairs Committee
S Res 113 S Res 29 S Res.101	Byrd (Va) Adams (Colo) Dickinson (Ia) McCarran (Nev) McAdoo (Calif)	To create a special Senate committee on Air Commerce and Civil Aviation to take over aeronautical functions now lodged in the Committees on Post Offices and on Interstate Commerce Favorably regarded by the Committee on Rules
S 2414	McKellar (Tenn)	To amend the Air Mail Act of June 12 1934 Provides for no increase in mail payment but permits extension up to 200 mile totals Redefines primary routes Permits mail to be carried on non mail schedules with restrictions regarding payment Limits executive compensation (For details see above)

BILLS NEWLY INTRODUCED

Number of Bill	Introduced By	Purpose
HR 8006	McGehee (Miss)	To supply training airplanes at government expense to any land grant college (practically all state universities falling into that class) that will hire competent personnel to operate them and that will give up to 200 hours of flight training to all students applying for it Would absorb numerous planes provide a hundred or more jobs for Reserve officers as instructors
HR 8024	King (Utah)	To permit the free supply to vocational schools and colleges of obsolete Army machinery and mechanical equipment supplementing such specific authority as already exists to turn over airplanes for non flying instruction
H.J.Res. 268 and H.J Res 287	Fish (N Y)	To prohibit in case of war anywhere in the world any export of military aircraft or other military equipment from the United States to any belligerent and to seek to persuade other nations to agree to follow the same rule of restraint
S.J Res 120	Clark (Mo) Nye (N Dak)	Another embargo resolution identical with H.J.Res 268 in purpose but considerably broader and limited to time of war but would come into effect at the President's discretion whenever the international situation might appear to him strained

Air Base Flurry

Canadian border mention brings Presidential censure

LATE IN APRIL the House Military Affairs Committee was holding its final executive session hearings on the Wilcox Bill, an important measure to provide bases throughout the country for the G H Q Air Force. Like most hearings at which high officers offer testimony on important defense plans, these had been closed to the public and the press, and would in the ordinary course of events never have been publicized.

Just how some of the confidential testimony of Generals Andrews and Kilbourne became available to the press, why it was sent to the Public Printer with the open testimony on the measure is not clear even at this date But that such a thing had occurred was only too evident the morning of April 28 when a hundred papers carried Kilbourne's explanation of the Army's selection of air base sites "I should be very glad to put in the bill the Great Lakes area but I could not put it in the bill because of the Canadian situation You will notice that No. 7 in my bill is camouflaged It is called intermediate stations for transcontinental flights, but it means the same thing"

G H Q Chief Andrews was no less spectacular on another related subject " even with Canada neutral, the enemy has the following bases available Newfoundland Bermuda, Bahamas, Jamaica, Trinidad, British Honduras, and the Lesser Antilles If the situation is sufficiently vital we must be prepared to seize these outlying bases to prevent " And so on Twice a hundred papers lamented the incident editorially that afternoon The next day came an inquiry to the State Department from the Canadian Minister on May 1 the publication of President

Roosevelt's letter to Committee Chairman McSwain

"It is necessary for me most respectfully to call to your attention and that of your committee the fact that if the testimony in the executive session is printed in public documents in the same way as testimony in open session, I shall find it necessary as Commander-in-Chief of the Army and Navy to require that in the future such testimony be given only after approval by me

"Referring to Page 16 of this printed document, I desire to inform your committee that certain portions of the testimony of General Kilbourne, especially those relating to the Canadian border, do not represent either the policy of this administration or that of the Commander-in-Chief."

Came then a reply from McSwain regretting accepting responsibility, absolving the generals Then a letter from Secretary Dern

What finally quieted the tempest was our northern neighbors' decision that it was of teapot dimensions and belonged in one. After all, Selfridge Field and Camp Borden had long been in existence One hundred and twenty-two years of peace could not be disturbed over such a thing as an air base, and every country was entitled to lay plans for potential eventualities

Fleet Problem 16

Navy's Pacific maneuvers include long mass flights, intense activities of carrier forces.

160 SURFACE CRAFT, 450 airplanes, 50,000 officers and men stormed about the Northeastern Pacific last month in what has been called the greatest mimic war exercise in the Navy's history Certainly it was the most strenuous test of its aircraft on record.

An analysis of the tactical lessons of the exercises, the complete plan of the far-flung "battles" and "contacts" must await the completion of the exercises on June 10 Up to the point of this writing the basic developments have been as follows A "Black" fleet sailed to the Aleutian Islands off the south western tip of Alaska then operated to the southward, eventually occupying Midway Island, 1 300 miles to the west and north of Hawaii The "White" fleet, making its base at Pearl Harbor, attacked the Black forces in the neighborhood of Midway, thus attempting to repulse the threat against the main Hawaiian group

The first outstanding aeronautical test was a flight by two patrol boat squadrons, VP-7 and VP-9, from San Diego to the Aleutians late in April, accompanied by the tender Wright They were rumored to be scheduled for a circumnavigation of the Northeastern Pacific (Aleutians, Midway, Honolulu, San Diego) They are now understood to be returning via the Pacific Coast.

Second was the mass flight of 43 patrol boats under the command of Commander E W Tod from Pearl Harbor to Midway Lagoon on May 9 The distance covered was 1 323 miles, and heavy rain squalls marked the trip At Midway they joined the Black fleet's carrier, Lexington to form an aerial force to oppose the Ranger and Langley, which remained with the White forces

From May 15 until the 22d, the carriers and patrol planes figured in wide flung scouting, bombing, and battle missions Twelve Corsairs catapulted from White cruisers, "destroyed" twelve of the patrol planes at Midway The patrol boats sighted the approaching White fleet then helped to bomb it hours before actual fleet contact The White carrier planes stood poised to bomb Midway in return

Then tragedy, which cannot be far when men and machines are under such gruelling tests, forced the suspension of aerial activities during the remainder of that phase of the problem

At 8 12 p m on the 22d Plane 10 of the patrol boat Squadron 6 was forced by engine trouble to land 50 miles south of the island Above it hovered another plane of the same squadron commanded by Lieutenant Harry Brandenburger, which radioed its position to surface craft At 10 30 the disabled plane was taken in tow by the U S S Raleigh, but meanwhile radio communication with Lieutenant Brandenburger had abruptly ceased Search started immediately The next morning a few bits of wreckage and an oil slick told the story of a "crash to a complete wreck" Probable cause an inadvertant spin from low altitude as the ship circled in the darkness Aboard, besides its commander, had been Lt (junior grade) Charles Skelly and four enlisted men

Funds for Navy

Senate approves huge Naval Appropriation Bill

WITH little debate, the Senate May 24 passed the $460,000,000 Naval Appropriations bill and sent it to conference. As passed, it differed in several features from the form in which it had emerged from the House, its aggregate being $1,801,585 above the House total

The measure authorizes 555 new planes, 160 to be purchased immediately, a total of $40,997,610 for aircraft construction, spare parts and accessories

Worst Crash

Soviet Giant wrecked by stunting trainer—49 killed

LARGEST land plane ever built was the Maxim Gorky It had a gross weight of 48 tons, a span of 210 ft., a total of 7,000 hp available from its eight motors It could carry 40 passengers and a crew of 23, was equipped with a news press a broadcasting station a cinema a voice-of-the-sky loudspeaker Its top speed was reported to be in the neighborhood of 150 m p h

Test flown in June of last year it had ranked in the hearts of Soviet workers by the side of the Dneperstroy Dam the Moscow Subway, and the tractors of the farm collectives as a triumph of Soviet progress On May 18 it was operating from the Moscow Central Aerodrome, carrying workmen and officials of the Central Aerodynamic Institute on sight seeing tours as a reward for their meritorious efforts By its side flew two small planes One contained pilot Blagin whose assignment was to fly close to the giant, thus emphasizing its bulk In the other were a pilot, and a cameraman

Suddenly Blagin, who had been stunting contrary to express orders, was caught in a gust his plane thrown onto the wing of the Gorky where, for an instant it hung wedged between two nacelles Then, before the eyes of the crowd below, the great plane disintegrated

Killed the eleven members of the crew the 37 passengers, pilot Blagin To the 48 in the Gorky the funeral of heroes in Red Square to stunter Blagin immortal censure in a new word coined for Soviets blaginism signifying "the lack of Socialist discipline and the employment of skill in showing off rather than in doing things to further the common good"

More Squadrons

Brief items from our foreign contemporaries

THE RACE in aircraft armaments started last March by Germany's frank admission that she was in possession of a complete and modern air force continued full-out last month

England has added $25,000,000 to the $105,000 000 already appropriated for this year's aviation fund, is considering telescoping a five-year program into the next two years. Specifically, she would

treble her home defense squadrons from their present strength of 498 until they consist of 1,460 first-line machines

France, with an enormous program of modernization already underway, was making plans to call an extra ordinary number of aeronautical reservists for training this summer

In Italy, Mussolini began recruiting for 1,300 new pilots, 4,750 new mechanics in a drive to bring Italian reserve strength to the 10,000 pilot level

Lesser powers, too, were looking to their air arms Austria, Hungary and Turkey planned to follow Germany's lead by re-establishing their squadrons. Rumania, Czecho-Slovakia, Poland Finland announced increases

More peaceful European news included the results of the annual 1,240 mile Deutsche de la Meurthe Cup Race Only five planes, all of them French, all of them Caudron Renaults, took part. Raymond Delmotte won at a speed of 275 72 m p h, establishing a record for speed over a 620-mile course Yves Lacombe was also credited with a new world mark, 290 78 m p h over 62 miles

A new plane service has been put in operation by Imperial Airways from London to Brindisi, thus completing an all-air route from London to Melbourne, Australia The bulk of its colonial mail and passenger traffic is still carried by train from Paris to Brindisi, however

The Spanish Postal Air Line, which recently acquired several Douglas transports, has opened a service between Paris and Madrid

Robert Kronfeld, Austrian soaring champion, flew on May 16 from London to Paris in a sail plane powered with a motorcycle engine Fuel consumption about 2 gal Average speed: 50 miles per hour

Spurred by preparations for extension of the several European airlines from Singapore to China, and by Pan American trans-Pacific developments, the Japan Air Transport Company has undertaken the survey of a Tokio-Singapore air route

The Soviet's new semi-rigid passenger airship, built in Russia under the direction of General Umberto Nobile, and destined for service on an air route between Moscow and Sverdlovsk, has completed a trial flight of 30 hours, 20 minutes

Rare indeed among air transport statistics is a decrease such as that registered by Air France from 1933 to 1934. Passenger-miles fell from 20,000,000 to 17,200,000, freight from 620,000 ton-miles to 468,000, mail from 382,000 ton-miles to 324,000

With Dr Hugo Eckener seriously ill, the Graf Zeppelin sailed for South America May 4, under a new Commander Anton Wittemann

Il Duce has dedicated the new Italian aeronautical laboratories and the settlement being built for the personnel who will operate it They are named in memory of General Alesandro Guidonia. Designed to collect most of Italy's aeronautical research work into one spot, the new center is equipped with extensive engine and fuel testing apparatus, including an altitude chamber, six wind tunnels, and elaborate chemical and physical laboratories.

EARHART MAJOR TRIUMPH NO. 5
was registered May 8 when she completed the first non stop flight from Mexico City to New York ever achieved Left to right Señor Edoardo Villasenor, Mexican Consul General, Miss Earhart, George Palmer Putnam, husband

Amelia from Mexico

Miss Earhart completes another pioneering adventure

FLYING the same red Wasp-powered Lockheed Vega which she had piloted to so many previous triumphs, Amelia Earhart landed at Newark Airport late in the evening of May 8 after making the first non-stop flight between that point and Mexico City Her time was fourteen hours and nineteen minutes for the 2,100-mile flight, thirteen hours and nineteen minutes between Mexico City and Washington Making the flight at an altitude near 10,000 ft, she had little of incident to report Her takeoff, although critical was beautifully handled Her heavily laden plane used up most of the 3-mile runway expressly prepared for her on the bottom of a dry lake bed.

More eventful had been her attempted 1,700 mile non stop flight late in April from Los Angeles to the Mexican capital Some confusion as to her exact whereabouts led to a precautionary landing some 50 miles from her goal. It spoiled her non-stop attempt, but not her welcome Some 40,000 enthusiastic Mexicans swarmed to meet her as she landed 13½ hours after take off

Financial Statements

Pan American's 1934 profit. Douglas leads in first quarter reports.

LAST YEAR was marked in PAN AMERICAN financial history as the first in which a dividend was paid, $315,819 on 631,640 shares outstanding. Consolidated earned surplus was increased $222,017 during the period

Income	
Income from operations	$ 9,242,583
Operating expenses	8,578,057
Cons net earnings	1,064,471
Dividends	315,819
Appropriated for self insured risks	405,186
Add to earned surplus	222,017
Balance sheet items Dec 31	
Cash and securities	$ 1,541,522
Total current assets	2,925,336
Airports bldgs, and equipment	11,381,237
Contracts, leases, concessions	2,458,738
Total assets	24,235,331
Total cur liabilities	998,828
Consol capital surplus	8,355,138
Consol earned surplus	548,793

● DOUGLAS AIRCRAFT Co, INC, for the quarter ended Feb 28 showed a net profit of $240,297 after all charges in-

cluding depreciation and allowance for federal taxes This is equivalent to 73 cents on each of the 467,403 shares outstanding and compares with a net profit of $8,205 for the same period a year ago Sales for the period totalled $2 451,576, unfinished orders on hand Feb 28 $4,225,000 Cost of sales for the quarter stood at $1 896 757 and included 26 per cent of the development cost of the new transport

• North American Aviation reports for the quarter ended March 31 a profit of $113 004 before depreciation and a consolidated net loss of $36 798 after depreciation.

• Boeing Airplane Co and its subsidiaries, Stearman and Boeing Aircraft of Canada, report a net loss of $213 262 for the first three months of this year. The figure includes a reserve of $113,590 invested in experimental planes and recoverable in case orders are secured for them. It also took into account depreciation at $22,675

Work in Progress

Douglas DC-3 details. News briefs from the industry.

That Douglas engineers had been working on a new transport, the DC-3, has been long known in a general way throughout the industry First specific published details, however, appeared in *Fortune* for May According to that publication, the ship will be wider, bigger, and capable of carrying 24 passengers as a day ship, 16 as a sleeper. It will have engines of 900 to 1,000 hp, fully automatic propellers, automatic mixture control No performance estimates were given

Controlling interest in the Lambert Aircraft Corporation (formerly the Monocoupe Company) has been sold by J D Wooster Lambert to Clare W. Bunch, former general manager for the company Mr Bunch, who is understood to have acquired the entire Lambert interest will serve as president for the coming year E E Freel will serve as secretary-treasurer, B L Carter as vice president Operations will be continued under the present name

The Los Angeles City Council has unanimously adopted an ordinance authorizing execution of a 43-year lease with North American Aviation for a factory site at their municipal airport

The Kreider Reisner Aircraft Corporation, which has been conducting final tests on the first of its Pan American high speed amphibians, has broken ground for the building of an addition to its plant at Hagerstown, Md

Consolidated Aircraft, which plans to move to San Diego in August will have the last four of the 23 patrol boats it is building for the Navy finished by May 20 Work will begin soon on its $2 300 000 Army contract for 50 pursuit planes. Reuben Fleet, president has made an offer to the city of Buffalo to leave the corporation's commercial plane manufacturing activities in that city, provided the city purchases the corporation's airport on Military Road.

The Luscombe Airplane Development Corporation has completed its move from Kansas City to the Mercer Airport at Trenton, and filed articles of incorporation in New Jersey

More details of the All American Aircraft Show to be held in Detroit July 20-28 are now available It is to be staged under the auspices of the Aeronautical Activities Association of Michigan whose president is Robert B Evans The Detroit Board of Commerce sponsor of the previous Detroit shows is actively cooperating as are the Adcraft Club of Detroit, and the Detroit Convention and Tourist Bureau Ray Cooper, as previously announced, is to be show manager and will be assisted by an executive committee consisting of Thomas B Colby secretary Benjamin E Young treasurer, Laurence J Lenhardt, Capt C. V Burnett, Edward J Hill, J Lee Barrett William A Mara G A Sweezey, Ralph Snoke, Harold Hastings, Earl J Smith and E S Evans

Dr Gordon M Kline of the United States Bureau of Standards has announced that a Bureau-N A C A research has shown that doped airplane fabrics can be made remarkably fire resistant by applying a pre coat of 3 7 horic acid borax mixture and subsequently using cellulose acetate in place of cellulose nitrate dope bases.

The first extensive demonstration trip of the Kellet wingless autogiro has recently been completed Cities visited included Harrisburg, Pittsburgh Columbus Dayton Washington, Baltimore, and Langley Field

What's Around That Corner?

After three months of uncertainty, air transport legislation at the present session is finally assured The Mead-McKellar bill is likely to become law by June 12, first anniversary of its McKellar-Black predecessor, almost certain to go through by the end of June As foreseen here two months ago, the Senate version is much less favorable to transport, much more punitive, than the House form. In the final adjustment the Senate bill is likely to be followed in most respects It is almost assured that the Interstate Commerce Commission will receive the power to adjust contract rates retroactively to March 1, but improbable that the positive limitation to 40 cents a mile maximum payment will be lifted The law as it finally passes will probably leave an unrestricted right of cancellation on 60 days' notice in the hands of the Postmaster-General, though this may possibly go out

The President's special message on transportation expected almost daily for four months, is finally near readiness for delivery and may be in the newspapers before this issue of Aviation reaches its readers The permanent legislation that he will seek, even though he has put it on his "musts" list has less than an even chance of being passed at the present session, not much better than that at the next one Any formal legislative action to reorganize and split up the I C C is likely to go over until after the 1936 election So is any attempt at reasonably permanent air transport legislation, unless there be more of an expression of public opinion on the subject during the next ten months than has appeared during the past eighteen

Congressional action on military aviation grows more and more unlikely The Wilcox-McSwain air base bill may pass, but even that is highly doubtful Procurement legislation is out of the question So is action on Air Corps personnel The session may end without even a simple authorizing act to increase the number of planes allowed to the Army though unless such an act goes through there is likely to be serious embarrassment in preparing next year's Air Corps budget

The indications for the coming summer are for an unprecedented volume of passenger traffic on the air lines, a possible total of 32,000,000 passenger-miles in July and the same in August as against a previous one-month high of about 24,000 000 With the Mead bill actually passed, orders for from 15 to 25 new transports are likely to be entered by operators within the next two months —E P W

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Schools, Services, and Airports

• ALABAMA—Tuscaloosa has applied to the State Public Works Board for $369,590 to build an airport . . . Major Leslie G Mulger has been active carrying passengers in a Ford Tri-motor from GADSDEN and nearby ports . . . The Birmingham Aero Club turned out recently for a demonstration of a new pursuit ship by Lieutenant William C McDonald from Maxwell Field

• ARIZONA—H Eugene Williams of PHOENIX, president of International Mines, Inc, has purchased a plane to use in inspecting his property His first trip, to El Fuerte on the west side of Mexico with Philip Collins as pilot was completed in April Distance 1,200 miles . . . An air show was planned at PRESCOTT for Memorial Day by the Yavapai County Chamber of Commerce Object to begin a fund for the erection of a hangar at Ernest A Love municipal airport

• ARKANSAS—Joseph A Young, manager of the LITTLE ROCK municipal airport since 1932, has resigned to join the Curtiss Company at Buffalo His successor will be Siesel A Franklin . . . The operation of removing the road across the field at LITTLE ROCK has been completed

• CALIFORNIA—The new THREE RIVERS airport in the San Joaquin Valley region was scheduled for dedication on June 9 . . . SAN DIEGO COUNTY Sheriff Ernest W Dort, who has organized 30 pilots into a volunteer squadron to cooperate with his office during emergencies, announces the election of T Claude Ryan as captain and operations officer, Jack Hicklin as secretary treasurer, Lt Comdr Vernon G Grant and Douglas T Kelly as executive committee members . . . Last year the tenth anniversary of the first round the-world flight was celebrated at Clover Field, SANTA MONICA, home port of the ships used, by a successful airmeet This April 15, a second was held to mark the 11th anniversary After a few preliminary events had been run off, the meet was cancelled Reason 30,000 spectators got out of control of Airport Manageress Ladya Kalishek's police and stampeded around the pylons . . . An appropriation of $109,563 to complete the headquarters building at the RIVERSIDE G·H·Q Air Force base has been approved by the state SERA . . . Capt B M Doolin, manager of the SAN FRANCISCO airport, has been in Washington seeking PWA approval for a $3,613 000 program of improvements

A NEW STYLE IN BIMOTORS
is set in this country by the two place monoplane built by W A Hammond and Geo K Fuller of Los Angeles Gross weight 1550 lb Weight empty 850 Power plant two 40 hp. Szekelys Wing span 34 ft 8 in

• COLORADO—$100,000 is being sought from the FERA for the modernization of the PUEBLO municipal airport. . . . Pilot Terry Hatchet was killed May 2, six miles west of LAMAR, his home airport, when the plane in which he was flying to Pueblo with pictures of the dust storm area crashed, following what witnesses described as wing failure

• CONNECTICUT—State Aviation Commissioner Charles L Morris has applied for $942,000 of relief money for a wide program of airport improvement throughout the state . . . Jack Lenox, former deputy state commissioner, has joined his brother as an instructor at the North Eastern Air College, at Mollison Airport

• DISTRICT OF COLUMBIA—S J Solomon, manager of the Washington airport, has been made a member of the airport committee of the Aeronautical Chamber of Commerce of America . . . Solution of the District's airport muddle seemed no nearer last month as Senator King, chairman of the Senate's District Committee took the stand that no new commercial airport was needed at this time Bills favoring various sites lay inactive before Congress

• FLORIDA—Despite an unfavorable preliminary report by Army engineers on a proposed land and seaplane base at Peter O Knight Field, DAVIS ISLAND Tampans were planning to actively endorse the project at a hearing set for May 27

• GEORGIA—The establishment of 21 ground schools to teach the fundamentals of aeronautics similar to those of Michigan (see below) is being considered by the FERA If approved, the schools will be located at Atlanta, Griffin, Albany, Americus, Savannah, La Grange, Rome, Waycross, Moultrie, Warm Springs, Baxley, Douglas Valdosta, Tifton Athens, Cordella Dalton,

Milledgeville, Madison and Augusta. Construction of a second airport for ATLANTA on the site of Camp Gordon has been approved by the FERA

• IDAHO—Lt L S Heral and Sgt. Warren Fachenthal have been making a survey of the LEWISTON municipal airport. Object: to frame a report on the field's suitability as a site for the proposed Rocky Mountain Air Corps base. The lighting of Kellogg Airport and the administration building at IDAHO FALLS are nearing completion

• ILLINOIS—The state aeronautics commission has moved its offices from the capital to the SPRINGFIELD municipal airport. A five year campaign to purchase the local commercial field for municipal airport was ended last month when the MOLINE City Council voted to acquire the land for $63,400, and various hangars and buildings belonging to E K Campbell for $8,000

• INDIANA—The St JOSEPH VALLEY Aviation Club, which has 46 active members and has recently ordered a fifth plane to add to its fleet has made plans to receive the Indiana Air Tour at SOUTH BEND on the night of June 17 Fifty planes are expected

• KANSAS—The WICHITA Aviation Club has been invited to enter planes in the Annual Missouri Air Tour scheduled for May 31 Several planes will probably be sent Meanwhile plans are being developed for a Kansas tour later in the summer

• KENTUCKY—The Louisville and Jefferson County Air Board announced that 120 out-of-town planes flew into LOUISVILLE for Derby Day, an increase of 40 per cent over last year's air visitors

• LOUISIANA—The aeronautical students of the Delgado Trades School of NEW ORLEANS working under the direction of B A Armstrong have completed the construction of a racing plane powered with a 12 cylinder water cooled engine Lacking funds for the special propeller such a plane would need to achieve all its potential performance the students of the school launched a money raising campaign, parading through the streets of the city with their plane the Delgado Maid escorted by a brass band, a large part of the student body

• MAINE—Work on the improvement of the LEWISTON-AUBURN airport has been renewed The board of aldermen of CALAIS have voted to use part of their relief labor on the St Croix airport at BARING. A movement has been set on foot to secure funds for an airport at NORRIDGEWALK.

• MARYLAND—City Council of HAGERSTOWN, which some months ago took over the Hagerstown Airport is considering the erection of a large hangar

• MASSACHUSETTS—Outpointing other members of a field of 40 New England college students planes, Richard King brought victory to Amherst in the first intercollegiate air meet in the country, May 11, at La Fleur Airport, NORTHAMPTON. Foreclosure sale of the Bowles-Agawam Airport at SPRINGFIELD, one of the largest in New England, was held May 15 to clear the way for the purchase of the property by interests who plan to convert a large part of it into a horse racing track The increased area of the EAST BOSTON Airport, the result of several years extensive filling operations, has required an enlargement of its lighting facilities About $20,000 will be spent for nine new floodlights

• MICHIGAN—The State Board of Aeronautics of Michigan is directed by Col Floyd E. Evans, has William B. Mayo as chairman of commissioners Several months ago it secured FERA funds to establish ground school instruction centers throughout the state As many of the 1,600 students at nearly 40 schools last month received certificates following their first ten weeks of study, the program seemed definitely a success (1) as a direct means of employing trained aeronautical personnel eligible for relief (2) as a stimulus of lay interest in aviation, many students re-enrolling for advanced instruction, many recruits appearing for new sections, (3) as a primer for flying schools and local flying at the state's airport Sample twelve students from the FERA course have signed for flying lessons with Forrest King of the Michigan County Airport

• MINNESOTA—The Thunderbird Flight a DULUTH flying club, operating under the direction of Clifford Canfield, has purchased a second plane for its 22 members The DULUTH Aviation Club, Dr. M R Herrmann, president, has announced tentative plans for an air meet in June, and will cooperate with local V F W. post in sponsoring a second meet July 4

• MISSOURI—According to the itinerary announced by Dr. J D Brock of KANSAS CITY this year's director, the annual tour, known as the Missouri Aerocade was due to leave Kansas City May 31, visit Springfield, Koshkonong Sikeston, St. Louis, Columbia, and St Joseph in a three-day program

• MONTANA—The airport in BUTTE has been completely equipped for day and night transport operation in connection with its increased services from Northwest and National Parks

• NEBRASKA—In a move to escape the Nebraska state gasoline tax of 4 cents, United Airlines has been studying the feasibility of using the COUNCIL BLUFFS, Iowa, field in place of its present Omaha terminal Alarmed OMAHA city councillors have petitioned the legislature to exempt aviation gasoline from the levy

• NEVADA—Newton Crumley Jr and Gordon Griswold have set up a charter service with a Bellanca at ELKO. A municipal airport to be built at the side of the present United Airlines field at RENO has been projected

• NEW HAMPSHIRE—Pilot Richard Worth has returned to operate at MAN-

NEWARK CELEBRATES

Air Transport Day in honor of the seventeenth anniversary of the first air mail flight A new administration building was dedicated. Miss Earhart christened a new Douglas Dolphin for the Stanavo fleet. Major Aldrin flew the Dolphin to set a world record in the new amphibian category Army squadrons went through paces

CHESTER after a year's absence in Massachusetts. Meanwhile Russel Hilliard, long manager of the Manchester base, has been supervising construction at, and also flying from the new NASHUA airport. . . The Nashua hangar will be ready in about a month, its complete runway area sometime this summer. Dedication is planned in September during the State Legion Convention.

• NEW JERSEY—Congressional Representative Kenney is seeking funds to enlarge and improve the TETERBORO airport. Meanwhile operators at that port have been breaking new ground toward low priced airplane rides by charging a 10-cent admission tax to the field and then giving each entrant a free ride.

• NEW MEXICO—ALBUQUERQUE is to be added to the country's upper air map in the near future according to U S Meteorologist Erle Hardy as he announced that the Weather Bureau would open bids late in May for daily airplane soundings to 17,000 ft. from that point. Other western cities where bids have been called for are EL PASO, SALT LAKE CITY, MEDFORD (Ore.), and SPOKANE.

• NEW YORK—American Airlines have offered to give their ELMIRA airport to that city, provided it agrees to spend $25,000 on immediate improvements and to maintain it. . . The Bengard Aviation Club of BUFFALO has moved its three planes to the municipal airport, plans an active flying season. . . The Albany Aircraft Company has leased the two municipally owned hangars at the ALBANY airport, will operate a charter service. . . Work has been under way for some weeks on WWAB, the Bureau of Air Commerce's new radio station near the BUFFALO AIRPORT. . . An extensive program of improvements on SCHENECTADY'S county airport has been completed. . . Construction of a new hangar is now planned. . . The airport managers of the state have formed an association (See Page 74). . . Fifty-one new students had signed up early last month for courses in ROCHESTER'S three flying schools. . . At ROOSEVELT FIELD Air Associates have enlarged their floor space to meet increasing business.

• NORTH CAROLINA—The Camel City Flying Service, operators of the WINSTON-SALEM airport, report the sale of a Taylor Cub to the Clemson Aero Club of Clemson, S C . . . GREENSBORO is considering proposals to improve the municipal airport.

• NORTH DAKOTA—The installation of complete lighting facilities on the FARGO municipal airport is practically finished.

• OHIO—Elmer and Melville Schmidt, operators of the Cincinnati Aircraft Company at LUNKEN airport, CINCINNATI, are organizing a club for those active in aeronautics at the field. . . The CLEVELAND chapter of the Ninety-Niners issued an invitation to all women pilots and student flyers to attend a meeting scheduled for May 26 at the municipal airport. . . The FINDLAY City Council has authorized its mayor to negotiate a 25-year lease for its airport so that FERA funds may be obtained for improvements.

• OKLAHOMA—Construction of another hangar, more lighting, and building of dikes for drainage control at the field are proposed improvements at the OKLAHOMA CITY airport for which federal funds are being sought.

• OREGON—BEND'S new airport on the Dallas-California highway, though still being improved, was opened in April by Lawrence J Sohler, Bend pilot. . . The Sportsman Pilots of Oregon, PORTLAND touring group have added nine new members to bring their total enrollment to sixteen. . . Additional hangars were being sought for the EUGENE airport as spring activities brought increasing aircraft to that field.

• PENNSYLVANIA—Among bills of interest to HARRISBURG fliers recently passed by the legislature was one prohibiting the erection of obstructions dangerous to aerial transportation adjacent to an airport. Last summer one Baron Von Stecki caused considerable furor by erecting a spite tower on the edge of their municipal airport. . . The State Aeronautics Bureau has completed plans for six fields to be built in the Northern Pennsylvania Mountains by CCC personnel. . . Nine ships took off from Patco airport near MORRISTOWN and a larger number left Wings Field near AMBLER late in April to carry their Philadelphia sportsman-owners to the Maryland Hunt held outside Baltimore.

• RHODE ISLAND—Daniel J Kiely, chief of the Division of State Airports of the Department of Public Works, has announced plans for commercially usable intermediate fields to be built at BLOCK ISLAND, NEWPORT, WESTERLY and WOONSOCKET as funds become available.

• SOUTH CAROLINA—A bill to adopt the uniform state licensing law passed the Senate and was submitted to the House of Representatives of the state legislature early last month. Governor Johnston had urged its quick passage. . . Two new operators set up in business recently: C. L. O'Dell at GREENVILLE with a Stinson Reliant; Weston Goode at ANDERSON with a Taylor Cub.

• TENNESSEE—A delegation of NASHVILLE city officials has been in Washington seeking an allotment for airport construction. . . Lowell Field (CHATTANOOGA) fliers expect the new Eastern Airlines service there to result in an increase of their charter trip work. . . An airport is under construction east of SMITHVILLE on highway No 26.

• TEXAS—Alderman Thompson of EL PASO has organized an advisory committee to promote an airmindedness campaign in that city. . . The Lou Foote Flying Service of Love Field (DALLAS) report recent sales of five Taylor Cubs in the North Texas region for which they are distributors.

• UTAH—The state's congressional delegation have agreed to unite in demanding that the Rocky Mountain Air Corps base be located somewhere in Northern Utah, rather than weaken their plea by splitting up in favor of different specific Utah sites.

• VERMONT—ST JOHNSBURY'S new airport on which 135 men have been employed, was recently approved for flying operations by the state's motor vehicle department. . . Fifteen planes turned up at BURLINGTON airport one day early in May, most of them for their semi-annual inspection by Robert B Hoyt, Bureau of A C representative.

• VIRGINIA—An Aero Club has been formed at WILLIAMSBURG with F V Ross as president, A L Neisel as vice-president. An airmeet has been planned for June 9. . . The University of Virginia has also organized a club, Archie Hahn, Jr serving as temporary chairman. . . Work on the LYNCHBURG airport is progressing rapidly, the East-West runway being nearly finished.

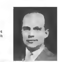
• WASHINGTON—Charles O Schick in charge of the BOEING FIELD weather station for six and a half years, is to trade positions with Clarence R. Kallquist of the SALT LAKE station. . . Gilbert Cook, officer of the Washington Aircraft and Transport Corporation, has been made a member of the Airport Committee of the Aeronautical Chamber of Commerce of America.

• WEST VIRGINIA—Harrison and Taylor Counties have agreed to purchase outright the land on which Tri-County airport near BRIDGEPORT is located. Improvements are planned. . . Capt H J Simmons has been named permanent chairman of the SPENCER Aero Club. The new administration building at the CHARLESTON airport is nearing completion.

• WISCONSIN—An airbase for the entire Great Lakes Coast Guard district will be located at MILWAUKEE if Washington approval is secured. It would cost $500,000 and absorb the CHICAGO and CLEVELAND bases.

Aviation People

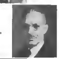
• The managers of over 25 airports in New York State, gathered on April 30 at the Buffalo Trap and Field Club, formed an association for the interchange of ideas on maintenance, operation, and legislation problems connected with their positions As president and secretary for the coming year they elected ROBERT ALDRICH, Troy manager, who is credited with being the originator of the idea for the association Other officers HOWARD SCHAFER, Syracuse, treasurer; NATHANIEL DUFFY, Buffalo, representative on legislative matters, executive committee, Mr. Aldrich, Mr Duffy, JOSEPH FITZGERALD of Albany, REGINALD HEATH of Utica, chairman of the executive committee, R LELAND KINKAID of Amboy A second meeting was planned for this month



Robert Aldrich

Paul Codos

• United Aircraft Export Corporation's extensive plans for surveying potential markets, which recently took ERNEST W DICHMAN to China, also sends E B HAINES to Durban to consult with representatives there on the sale of the company's products in South Africa Mr Haines, who is assistant to the president, expects to return to the United States about Sept 1

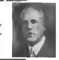


E B Haines

• Recently announced as seventh Guggenheim medalist is DR. WILLIAM FREDERICK DURAND, Professor Emeritus of Mechanical Engineering at Stanford University Dr Durand was a pioneer in the development of aerodynamic theory and research and has made distinguished contributions in the field of propeller design He was recently appointed chairman of a committee to advise the Navy Department on the advisability of continuing the airship programme He is the author of many publications and is now serving as Editor-in-chief of a six-volume work on "Aerodynamic Theory"

Brig Gen Augustine W Robins

• ROBERT W A BREWER, veteran of over 25 years of aircraft engine and automotive development work, author of one of the earliest texts on aeronautical engineering and recipient of many awards and honors, is now engaged in engine development work at the Naval aircraft factory at Philadelphia. A program of engine design and production is being worked out there to meet the requirements of the Vinson bill of 1934, calling for the Navy to build 10 per cent of its own engines Mr Brewer whose early work was done in England, came to the United States shortly after the war and has since been active as designer and consultant here



Robert W A Brewer

Dr John D Brock

• From Paris comes the announcement that PAUL CODOS, JEAN MERMOZ, and RENE GENIN are to be the new directors of Air France operations Codos co-holder of the world's distance record, will be in charge of developments toward a North Atlantic service Mermoz, who has himself flown the South Atlantic repeatedly, will direct the South Atlantic and South American lines Genin, a veteran familiar with every airline in Europe, will head operations on the Continent

• T HAROLD (DOC) KINKAID has joined CAPT AL WILLIAMS in the Sales Department of the Gulf Refining Company as a lubricating engineer Kinkaid needs little introduction to the industry With headquarters at Pittsburgh he will travel widely throughout the country visiting airports and factories

• BRIG-GEN AUGUSTINE W ROBINS, recently assigned to Wright Field in charge of the Air Corps Material Division as Assistant Chief of the Air Corps, has been appointed by President Roosevelt as a member of the National Advisory Committee for Aeronautics

• The Langley Gold Medal of the Smithsonian Institution was presented to DR JOSEPH S AMES, president of Johns Hopkins, at a luncheon in Washington on May 21 (AVIATION, March)

• The appointment of ROGERS M. COMBS, JR, as sales manager and GLEN G JURY as transportation manager has been announced by American Airlines Both positions are newly created Sales Manager Combs air express traffic manager for the company for the past three years, was active in the organization and development of General Air Express and has been its chairman since 1933 Transportation Manager Jury has been assistant general traffic manager for the past year and has been in airline traffic work since 1926 when he joined the Stout Airlines

• On Nov 15, 1929, DR JOHN D BROCK of Kansas City Mo, sportsman pilot, set himself the task of demonstrating that steady daily flying was a practical possibility A manufacturer and distributor of optical goods, he has been able to use many of his flights directly in his business affairs, has found his steadily mounting record increasingly an asset. On May 7, the Doctor who will direct this year's annual Missouri Air Tour, landed at the Washington

Airport after his 2,000th consecutive flight, was tendered a luncheon in honor of the occasion by Senator McAdoo, president of the National Aeronautic Association

• Stating that the high standard of flying both in the R C A F and by all civil instructors, is due in large measure to his instruction and example, the Department of National Defence has awarded to FLIGHT LIEUT E. G FULLERTON the McKee Trans-Canada Trophy for 1934 Fullerton, second in command at the Royal Canadian Air Force station at Rockcliffe, saw active service with the Royal Naval Air Force and the Royal Air Force, and in 1922 accompanied Capt R Amundsen on his Polar expedition He is credited with the introduction and development of instrument and night flying instruction at Camp Borden, Ont., while serving there as chief instructor

• Flying down to the Argentine, REX MARTIN, Assistant Director of the Bureau of Air Commerce, arrived last month in Buenos Aires to participate in the sessions of the Pan American Commercial Conference, to which he had been appointed aviation adviser to the American delegation Mr Martin placed before the delegates the knowledge and experience gained by the United States on the topics of port facilities, customs duties, and improvement of aerial communications

• COL HARRY C FRY, JR., long active in Pittsburgh airport affairs was recently honored at a testimonial banquet by the Aero Club of that City RAY A. TUCKER president, acted as chairman, MAJ LOUIS T. BARRY as toastmaster Colonel Fry has been made an honorary member

• The State Department announces creation of a committee to consider questions that arise with respect to international civil aviation in which the United States may have an interest. Members: ASSISTANT SECRETARY MOORE, RICHARD SOUTHGATE chief, DIVISION of Protocol and Conferences, JOSEPH R. BAKER, assistant to the legal adviser, and STEPHEN LATCHFORD, Treaty Division

• The Bureau of Air Commerce has appointed four new members to its Development Section ELISHA N FALES, ALFRED V VERVILLE, IRVING R METCALF, and WALTER T BROWNELL Mr Fales, with a background in aerodynamics dating from 1911 and former director of wind tunnel work at McCook Field will pass on new designs from an aerodynamic standpoint and work on new types of controls and similar problems Mr Brownell's assignment is to investigate and flight test new aircraft and engine designs Mr Metcalf will have under his advisement problems pertaining to aircraft materials production methods, and the development of instruments Mr Verville, who has been active as a designer of aircraft for two decades, will deal with general design features He comes to the new task from eight months as chief of the Bureau's Manufacturing Inspection Service LAWRENCE V KERBER, recently professor of applied aeronautics at Michigan University, becomes acting chief of that service

Side Slips

By Robert R. Osborn

Some Tabloid Notes of the Annual Visit to the Langley Field Laboratories

PROBABLY the most popular of any of the conferences so far—the first time all of the staterooms on the boat have been full, with some of the late arrivals sleeping on cots set up in the passageways.

COLONEL LINDBERGH very happy to be with a crowd which didn't follow his every footstep and demand his autograph

ED WARNER, editor of the world's best aeronautical magazine (adv), running around with his hair mussed up, as it used to be in the old days—a good sign that all will be well with aeronautics soon again

TED WRIGHT, of Curtiss-Wright, was discovered to have the loudest pair of pajamas on the boat—of beautiful green silk

MR VICTORY, of the N A C A., had to count up the cash received and check against the ticket stubs four times before he could get them to agree Once they balanced he didn't dare to try to check them again

AS USUAL, the "after-deck quartet" got under way each night on the boat. The most persistent sleep destroyers this year were Casey Jones, Temp Joyce and Henry Berliner.

D W TOMLINSON and W. A Hamilton both of Transcontinental and Western Air, spent most of their time around the high altitude engine tests and sneaked off in the afternoon to see a side-type supercharger installation on an Army airplane at the field The air transport boys are certainly getting high altitude conscious

WALTER DIEHL wandering around from group to group getting a new collection of stories for the coming year

UNFORTUNATELY Bob Woods of Consolidated was assigned a stateroom on the boat right over the gangplank entrance From this vantage point he held up the boat sailing ten minutes by pouring water on the passengers trying to get aboard.

TROUBLE ahead for Navy contractors! Lieutenant Commander MacCart was observed in several of the lectures and discussion groups, noting down all of the complicated formulas containing many Greek letters and mathematical symbols

BILL STOUT, of Stout Engineering Laboratories, paying his expenses by side bets on the "Bagatell" marble games on the boat

JIMMIE DOOLITTLE, selling Shell Oil, and complaining that none of the N A C A. movie shows contained any "Mickey Mouse" reels

DR. AMES, of the N.A.C.A, starting off with his usual emphatic demands that the late-arriving guests "KINDLY take your seats," followed by his usual gracious address of welcome.

DON WOODS, of the N A C.A, prefacing his very interesting lecture with the remark that "it might be rather long and anyone getting tired of it could walk out without hurting my feelings"

MOST of those taking a ride on the car of the large towing basin kept one eye on the models and the other on the end of the tank to make sure the operator didn't overshoot.

DR LEWIS, of the N A C.A, still smoking a cigar that never seems to be any longer, or shorter, than two inches

STEVE ZAND threatening to soundproof all loud speakers on the boat

LES NEVILLE, of AVIATION, sneaking up on us in each laboratory and lecture to remind us that this copy had to be in by this week end or else

Buyers' Log Book

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials

AIRPLANE ACCESSORIES — **Catalog**

Eclipse Aviation Corporation,
East Orange, N J

NEW loose-leaf catalog covers all the more familiar Eclipse products such as starters, dynamotors, control boxes, etc, as well as newer items including controllable pitch propellers, de-icer accessories, and fuel flow meters for test stand and airplane mounting Outline of operating procedure and simplified instructions for installation for all items

AVIATION, *June, 1935*

AIRPLANE ACCESSORIES — **Catalog**

Karl Ort,
608 40 West Poplar, York, Pa

ALL kinds of equipment for maintenance shops, pilots fixed base operators, and even the ordinary aviation 'fan' who wants an ancient aerial bomb or an obsolete propeller to hang in his room are covered in Ort's new catalog. Contains 42 pages of descriptive material, illustrations and tables To help defray printing charges, the cost per catalog is 10 cents

AVIATION, *June, 1935*

ENGINE ACCESSORIES — **Tachometer**

General Electric Company,
Schenectady, N Y

NEW General Electric tachometer retains the generated-frequency principle of preceding G-E instruments but has greater accuracy, longer life, less maintenance expense Easy to install, easy to read, completely radio-shielded. Outfit consists of inductor-type generating unit and an indicating instrument arranged for A-N standard mounting Total weight about 4 lb

AVIATION, *June, 1935*

INSTRUMENTS — **Aperiodic Compass**

E S Ritchie & Sons,
112 Cypress St, Brookline, Mass

MARK III Aperiodic Compass is a dead-beat instrument with powerful magnets damped by eight fine radial filaments submerged in the liquid, instead of the usual card Metal gasket seals bowl against evaporation Azimuth degree marks engraved on rotatable verg ring that also carries set of parallel grid lines in N-S direction May be supplied with DeFlorez bellows mounting

AVIATION, *June, 1935*

INSTRUMENTS — **Catalog**

Kollsman Instrument Co,
1 Junius St, Brooklyn, N Y

KOLLSMAN precision aircraft instruments are fully described and cataloged in a new loose-leaf binder Covers all standard instruments such as altimeters, air speed indicators, clocks, compasses Also manifold pressure gages, tachometers, etc Quick mounting system and new indirect lighting method are also described Data includes installation diagrams weights

AVIATION, *June, 1935*

MATERIALS — **Cleaning compound**

Curran Corporation,
Somerville, Mass

"GUNK" is a new chemical cleaning compound claimed to react with mineral oils and greases to make them water soluble. Parts to be cleaned are sprayed with cold Gunk solution (no steam or hot water required) followed by cold water rinse May be used on all painted and metallic surfaces Non inflammable Shipped in concentrated form.

AVIATION, *June, 1935*

MATERIALS — **Steel Tubing (Catalog)**

Summerill Tubing Co,
Bridgeport, Pa

NEW catalog includes aircraft and radio tubing Tables and illustrations cover all sizes and shapes available, plus tables of chemical composition, specifications, normalized physical properties, heat treatment, and standard tolerances Useful mathematical conversion tables and formulas included Fifty five pages, attractively printed, heavy paper covers

AVIATION, *June, 1935*

SHOP EQUIPMENT — **Hand Grinder**

Chicago Wheel & Manufacturing Co,
1101 W Monroe St, Chicago, Ill

DE LUXE HAND-EE GRINDER has a speed of 25,000 r p m and ample power to drive a variety of grinding or polishing wheels (up to 1½ in), cutters and engraving tools New type radial commutator, fan cooling and built-in switch with sliding contacts Six inches long overall, 1⅛ in in diameter, may be held like a pencil Weight, 15 oz. Operates on 110 v AC or DC

AVIATION, *June, 1935*

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100A and 100B

$2200 and up

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Branch Office—Sales Division, 45 Vanderbilt Ave., New York City

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Cabin Model YKC. Jacobs motor. Perfect condition. 70 gallon tanks, flares, landing lights, complete blind flying instruments, radio. 300 flying hours.
Price very reasonable.
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Sacrifice $1500.00, Trades Considered

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180 Hp. Challenger Engine
Late type cam. Just completely overhauled with no time since, and in perfect condition. $300. Suffolk Airport, Westhampton Beach, L. I., N. Y.

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Don't buy anything until you get Ort's new 1935 Catalogue. Prices are lower. Send this dime today. Karl Ort, 601 W. Poplar, York, Pa.

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With Waco F and F2 struts including rudder. Less than fifty hours use. Mississippi Airways, Davenport, Iowa.

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LATE KINNER EAGLE $640. Aeronca $850. Warner Commandaire $850. OXX6 Travelair Waco $485. Siemens Cessna $740. Commuter $1,630. Fleet $1,100. Fairchild 22 $1,300. OX Robin $400. Travelair $350. Eaglerock $205. J-5 Travelair, Waco, Stinson, Waco C. Reliants, etc. Terms arranged. Pioneer Aircraft, Airport, Syracuse, N. Y.

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THE CONSOLIDATED AIRCRAFT CORPORATION, BUFFALO, N. Y.

THIS IS THE VALVE

THAT WAS USED IN THE MOTORS

(Four 700 h. p. Pratt & Whitney "Hornets")

THAT POWERED THE SHIP

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CLIPPER PLANE REACHES HAWAII IN RECORD TIME

Huge Pan American ... Nearly ... out of Schedule

TRIP IN 17 AND HALF HOURS

Cheering Crowd Gathers at U. S. Navy Base to Greet Ship Destined to Inaugurate Regular Transpacific Travel

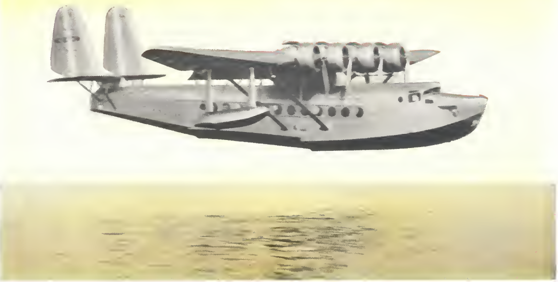
THAT SET THE LATEST GREAT RECORD

(California to Hawaii—17 hrs., 53 minutes)

THOMPSON PRODUCTS, INC., CLEVELAND, OHIO

Thompson Valves

PAA's Sikorsky "Brazilian Clipper" makes air history ··· U.S. to Hawaii and return ··· *Eclipse Equipped*



THIS historic April round-trip flight between United States and Hawaii in 37¾ hours is brilliant proof of the thorough, serious preparation which preceded the flight. The famous S-42 flying boat, as is traditional with PAA aircraft, is Eclipse-equipped. Installed thereon are Eclipse Direct Cranking Electric Starters, Engine Driven Battery Charging Generators, Starter Control Switches and Battery Booster Coils.

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